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The TOOL ENGINEER

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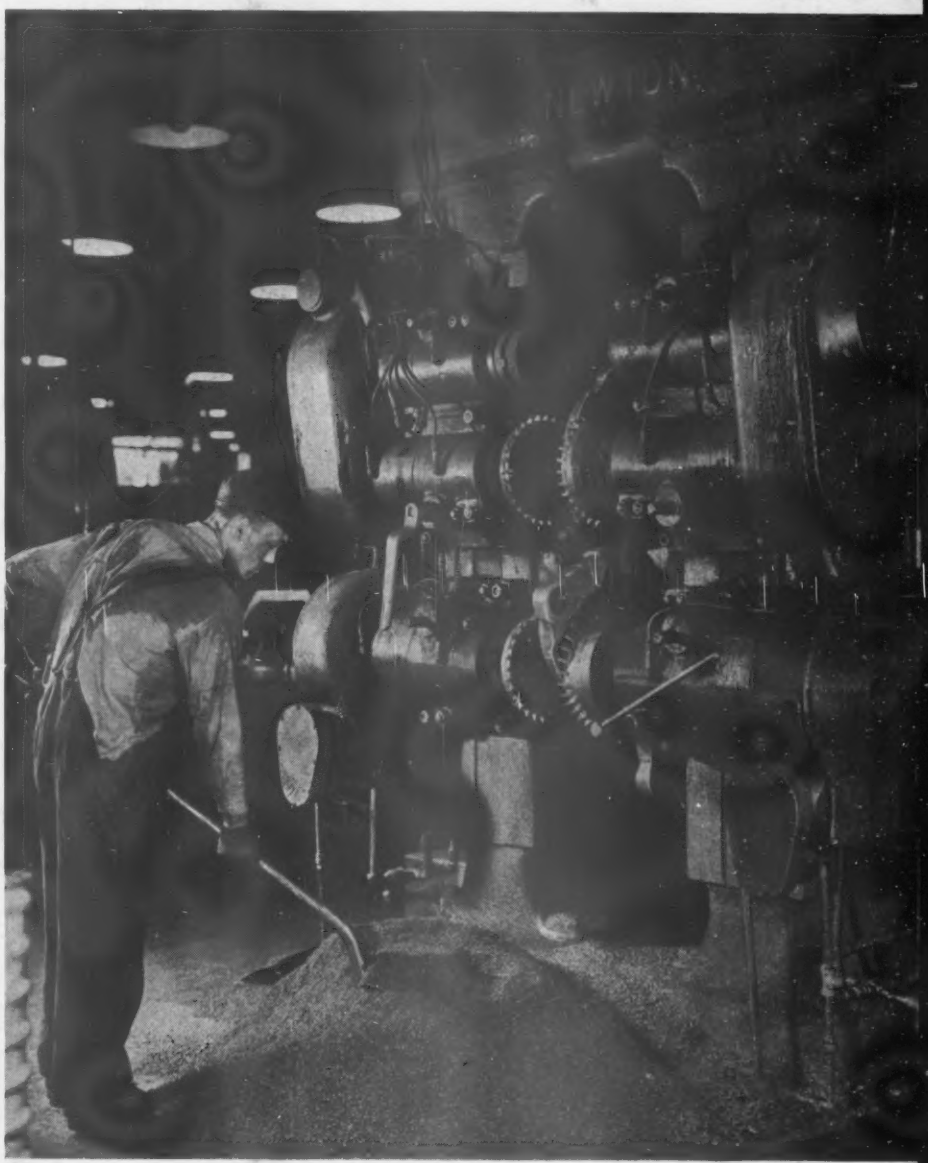

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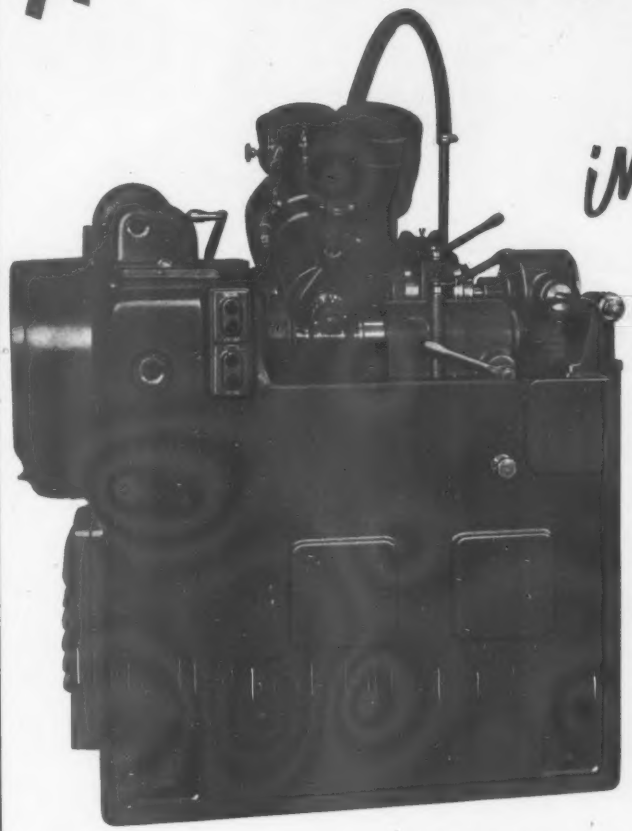

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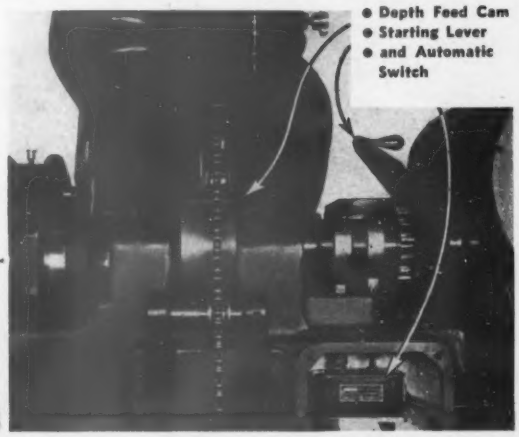

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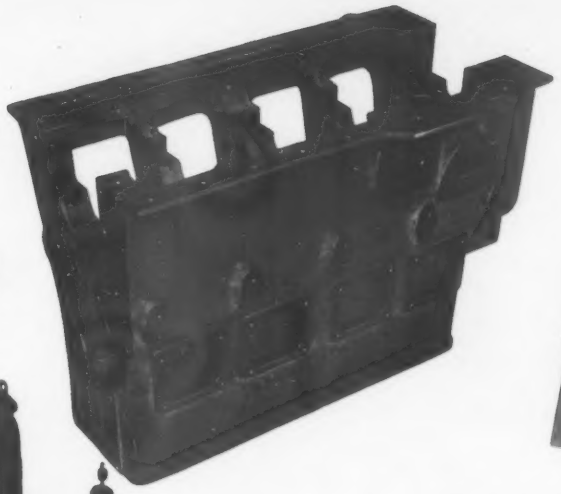

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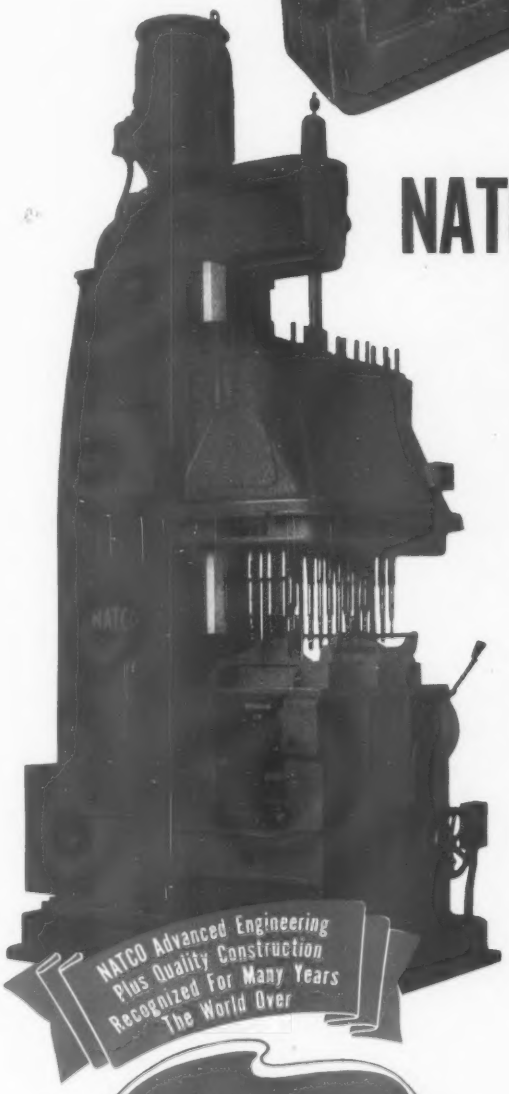
NATCO HOLESTEEL Heavy Duty Multi-Spindle Driller



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Vol. VII JUNE, 1938 No. 2

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The Tool Engineer is published approximately the first of each month. It is the official publication of the American Society of Tool Engineers, Incorporated. The membership of the Society and readers of this publication are practical manufacturing executives such as master mechanics, works managers, Tool Engineers, tool designers and others who are responsible for production in mass manufacturing plants throughout the nation and in some foreign countries.

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Published by
THE BRAMSON PUBLISHING CO.
2842 W. Grand Boulevard MAdison 7553 Detroit, Michigan
Roy T. Bramson, Publisher and Editor

ADVERTISING OFFICES:

Chicago, Illinois
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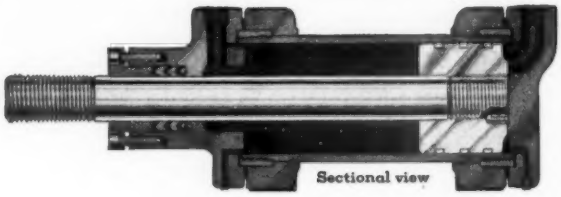
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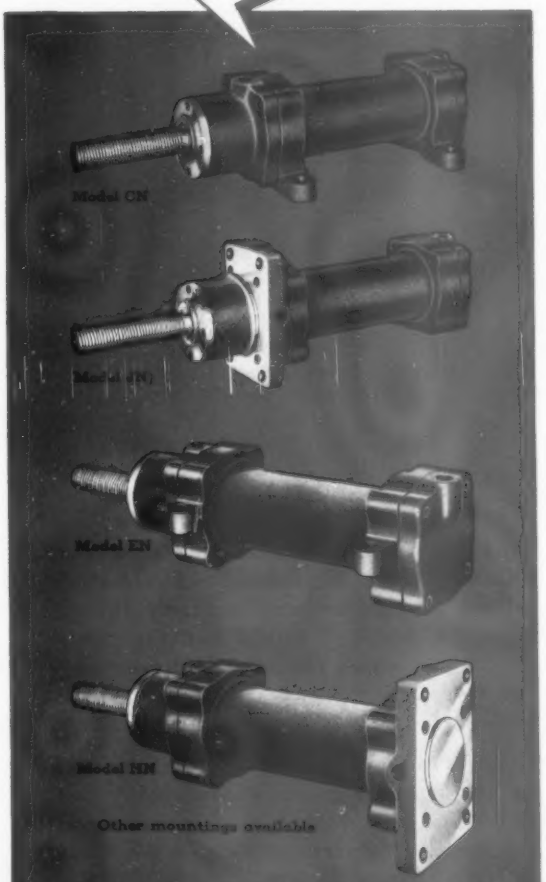

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TECHNOLOGICAL ADVANCE FOR NATIONAL PROGRESS

AN EDITORIAL

By

A. E. Rylander

AS a result of a visit to the A.S.T.E. Tool Show, a manufacturer purchased a highly specialized machine. When it was installed and its advantages demonstrated, a toolmaker remarked: "Just something else to throw us birds out of a job. That machine will do in an hour what it would take a skilled man all day to do the old way." Which is looking at improved equipment from one angle. But what the toolmaker quite overlooked was that a considerable number of men—designers, patternmakers, foundrymen, steel makers, machinists, other toolmakers and so on—had been employed in its making. He did not see beyond his own limited sphere of activity.

All of which brings up the mooted question: Does technological advance create unemployment? As engineers, we know that improvements in processing and methods create employment, that the production of manufactured goods at reduced costs opens up markets because of increased demand. Or, inversely, that the creation of a new product, superseding previous methods or uses, in turn creates a new industry that will eventually employ masses of workers. As, for instance, the advent of the iceless refrigerator and, latterly, the introduction of plastics. True, the first threatened the jobs of a comparatively small body of icemen, the latter a proportionate number of cabinet makers. But, for every iceman displaced a score have been employed in the refrigerator industry, while plastic goods, so much cheaper than articles of fabricated wood, have opened markets previously unexplored. And that goes for new creations, ad infinitum.

I say, we know these things. But, the masses of the people do not know it, or, having given the matter a thought, do not follow it to a logical conclusion. Generally, the public is swayed by those who give thoughtless—and often, prejudiced—expression to the fallacy that modern machinery is one cause of unemployment. So deeply is this fallacy rooted that, at this time, a bill designed to restrict technological improvement is actually under consideration in Washington. Which would work out like the story of the contractor digging an excavation with a steam shovel.

"Don't you know," a bystander remarked. "that if you gave a hundred men a shovel apiece, they could dig that hole as well and you'd be spreading employment?"

"Yeah? But why not give a thousand men a spoon apiece, and spread it the more."

For the sake of our own economic salvation, to say nothing of others dependent on our creativeness for employment, it is time that the engineers started a campaign of education, selling the advantages of technological advance to the public. In doing so, we must concede the facts, that the object of improvement is to produce goods at lower cost, and that in doing so a certain proportion of workers will be temporarily displaced. But, we have countless cases, as analogy, to prove that the net result is to create and spread employment, that recessions are not caused by improvements in machines and methods but by conditions over which the engineers have little or no control. One voice out of many can't prevail in a gale of wind roused by the opposition, but if we all pitch in we might be heard. Suppose, now, that we all join in the chorus: "Technological advance for national progress." Let's go!

The MANUFACTURE and HEAT TREATMENT of SPRINGS

By ERNEST L. GOFF

SUPT. SPIRAL DIV. WALLACE BARNES COMPANY

THE manufacture of the thousands of miscellaneous springs which are required for modern mechanical devices gets into so many problems of steel manufacture, designing, heat treatment, etc., that in looking for information on the subject one scarcely knows where to go, and in fact, a great deal of the information cannot be found on file, but can only be learned through familiarity with the business of manufacturing springs.

We will take up first the matter of heat treatment, showing its relation as far back as the manufacture of the material itself, to the successful operation of springs.

Effect and Importance of Heat Treatment on Springs and Spring Materials

The heat treatment of high carbon and low carbon steels is virtually the same through the melting and hot rolling processes, but from then on, particularly in the spring wires, we find a distinct difference. We find that while annealing is carried on much the same in high carbon steel as it is in low carbons (except for the speed of cooling) that these processes known as hardening and tempering and so-called patenting are applied to the spring steels only, and endow them with properties of tensile strength, elastic limit, and endurance unknown to the soft wires. Thus we are able through various combinations of cold work and heat treatment to produce spring materials which have tensile strengths as high as 400,000 pounds per square inch and which will withstand fiber stresses as high as 300,000 pounds per square inch without rupture. Such materials are known as clock spring wire, which is annealed and cold rolled many times to the correct size and then hardened and tempered; music wire, which is patented and cold drawn to size; tempered wire, which is annealed, cold drawn to size and then oil tempered, etc.

It is apparent that the heat treatment on music wire, for instance, which is drawn from approximately ¼" diameter down as small as .004" diameter with a uniform tensile from three to four hundred thousand pounds per square inch, must be practically absolute in uniformity.

It will also be apparent that annealing on a coil of clock spring wire must be uniform when it is considered that the material must be rolled many times to final size, tempered to a tensile of 250,000 to 300,000 pounds per square inch. It is interesting to figure that one thousand clock springs might require about two miles of stock, all of which is stressed up to 250,000 to 300,000 pounds per square inch in its original winding and that the most infinitesimal flaw or check will cause breakage, and yet this processing is carried on so uniformly that not over one percent will break in the winding.

The two processes above mentioned are entirely different, and yet each produces spring material of great usefulness and high physical properties. In the case of the music wire the patenting consists of heating the green hot rolled rods to a high temperature (say 1800 degrees "F") then quenching in lead or air at a speed to produce sorbite. The wire is then cold drawn, the coarse grain size obtained by the heat treatment producing a long fiber which increases greatly the toughness of the wire, particularly in torsion. The processes of patenting and drawing through the die are then alternated down to the finished size, the wire remaining in the sorbitic condition throughout.

In the case of the clock spring wires the rods are annealed at the critical range under such conditions as will bring about complete spheroidization of the carbide and a hardness of about 75 to 80 Rockwell B. The wire is then rolled approximately 20%, then process annealed at a heat just under the critical to bring about relief of the cold working strains, but not to disturb the structure. It is then alternately rolled and annealed down to finished size and then hardened and tempered.

These two processes with their variations constitute the two general methods of cold reduction of spring steel and wire.

Still another important effect of heat treatment in spring steels is in the ductility or forming qualities of cold rolled sheet spring steel which is used for making special flat springs which have to be bent, formed, or deep drawn. Not long since, we looked with doubt on a part which required any sharp bends or drawing which had to be made of spring steel. Today we find it entirely possible, by thoroughly spheroidizing our spring steels and by careful regulation of the size and distribution of the carbides, to produce steels up to 80 carbon with excellent drawing qualities, and up to 1% carbon which will fold on itself either way of the grain.

This is of the utmost importance to the spring manufacturer.

Effect and Importance of Heat Treatment on Strength and Capacity of Springs

To get a true picture of the effect of heat treatment on the strength of springs it is necessary to encroach upon our subject of spring design to the extent of finding just what factors do control the strength of springs.

For some reason spring manufacture has always been looked upon by the average person as an art rather than a science, and there has always been an atmosphere of mystery surrounding the so-called "art of tempering." This has, perhaps, persisted since the days of Damascus' sword practice when it was found necessary after the sword was heated to the proper temperature to quench it by plunging it through the bowels of a slave, no other medium being capable of imparting just the right characteristics.

And so many people even today are under the impression that the spring maker, through some uncanny power, can make a spring stronger or weaker by some change in the heat treatment.

Therefore, we can profitably spend a little time in study of this matter and make clear these facts:

First—That getting a spring to deliver certain predetermined loads is a matter of good engineering design—and not heat treatment.

Second—That heat treatment can only affect the strength of a spring inasmuch as it allows the design of the spring to change, or, in other words, lets the spring take permanent set and thus change its shape.

Or, in other words, a spring made of soft material would support as much load as one that was heat treated, provided we did not exceed the elastic limit of the material.

To find out why this is so we must realize that springs have the same characteristics as other engineering materials. First they answer to Hooke's Law, which states that stress is proportionate to strain up to the elastic limit of the material, or in other words, if a spring supports 100 pounds though one inch deflection it will carry 200 pounds through two inches, etc.

We also find that in deriving a formula for a spring that we can take the ordinary physical properties of the metal and combine these with certain mathematical factors, which allow for the shape or form of the spring.

We find that these physical properties are the same as we would use in designing a bridge, skyscraper, or any other steel structure, the difference being that instead of designing our spring to sustain certain loads with as little motion as possible, we design them to deflect a definite distance under load.

In looking at materials which we might wish to use for springs, we find that they have varying properties. We know that some materials are fine for springs and some are no good at all.

Selecting Spring Materials

For instance, cast iron is useless for spring purposes; a piece of stick sulphur would take no deflection whatsoever before breaking, and a piece of rubber, which might be capable of being stretched a great distance and return to its original length would present little resistance to stress, whereas in the case of spring steels we not only have a high elastic limit, but also we have a high resistance to stress. We know that these variations are present in material, and we have to be able to select a material which is suitable, and have to have a common language by which we can recognize these properties and compare one material with another. Then we find that they have two important characteristics, one of which is the resistance to stress or stiffness, and the other of which is the amount of travel or deflection that a specimen will undergo before taking permanent set, or, in other words, the elastic limit.

Thus the total usefulness of a piece of metal or a spring, as far as spring loads is concerned, is expressed by a combination of its stiffness or unit load, with its elastic limit or the amount of deflection that it will take.

To get this matter of stiffness into standard terms so that one material could be compared with another, a man by the name of "Young" made exhaustive studies and devised a unit of measure. He determined that the stiffness of a material and the amount that it could be deflected were two entirely separate factors. He set up a factor known today as "Young's modulus of elasticity" which consists of a factor obtained by dividing the unit stress of a material by the unit deformation. If we are talking of modulus in tension, all it means is the number of pounds which we would develop if we took a block of material 1" in each dimension and stretched it continuously in one direction until it measured 2", provided this could be done within the elastic limit.

This factor is of the utmost importance in spring design, and should be looked upon as that important factor which distinguishes the resistance or stiffness of one material from that of another.

The peculiar part of this so-called modulus is that all steels seem to have approximately the same modulus, and what difference there is, is not brought about by heat treatment at all, but by other factors, such as analysis and size, but for all ordinary spring calculations, we can treat the modulus as constant, and in the case of steel use 30,000,000 in tension and 12,000,000 in torsion. The torsional modulus of some other spring materials is—of hard drawn stainless 18/8, 9,750,000 — monel, 9,200,000 — phosphor bronze 6,250,000 and brass 5,500,000.

The other physical property of metals used in spring design is elastic limit, which controls the distance that a spring can be deflected without permanent set, and is a direct result of the quality of the material and its heat treatment.

Spring Design

In considering the subject of design of springs, it would, of course, not be possible to discuss this exhaustively in a few words or to attempt to show how the various mathematical formulae are derived. We have already shown in discussing heat treatment and its effect on design the fact that the unit load is a direct result of the stiffness or modulus of elasticity of the material, and the total capacity of the spring is the combination of this stiffness with the number of inches which the spring will deflect before reaching its elastic limit.

The formulae covering the unit load and load capacity of all type of springs can be found in almost any good engineering handbook.

One of the most interesting phases of spring designing is the effect of variations or tolerances from given dimensions on the working of the spring itself, and by taking up a few examples of this we can shed a great amount of light on spring design in general and give a new idea of the degree of accuracy required in the manufacturing of springs.

Consider, if you will, the insignificant lever spring in the distributor of your automobile engine. You may give it scant attention, but it must return the circuit breaker lever to its original position with a tension which usually varies not over two ounces from a mean weight and might possibly do this 250,000,000 times in operating an eight cylinder engine for 25,000 miles. We might consider the spark control which controls the advance or retard of the spark as the throttle is opened or shut, actuated by a spring which will not vary in length over five one thousandths of an inch under a given loading. Such examples could be multiplied indefinitely.

The spring manufacturer has to worry about more tolerances than are met with in many machined parts.

For instance, the tolerances in the material itself which comes to him or is made by him in the shape of rolled strip steel or drawn wire. Without going into these in any detail, it is interesting to note a few causes of variation in cold rolling a strip of steel. Some of these are variation in size and quality of the hot rolled bars, heating and change of temperature in the rolls, the spring of the rolls, the give in the roll necks and bearings, eccentric grinding of the rolls, etc. Similar causes of variation might be found in wire drawing, and while these variations might amount to only a thousandth, a half or even a quarter thousandth of an inch, they affect vitally the action of the spring. Following the manufacture of the material comes the difficulties of fabricating the spring itself, not only in forming to the correct shape, but also much more difficult, the art of heat treating it without deformation.

It is well to remember again, that the load characteristics of a spring depend entirely upon the physical dimensions, provided the spring is working within the elastic limit, so that in order to have variations or change in the test of a spring, it is necessary to vary the dimensions in order to obtain it, and such changes cannot be effected by either raising or lowering the temper or changing the heat treatment in any way.

In considering the affect of tolerances, we will first consider a simple flat spring. The deflection varies directly as the load and directly as the cube of the length, and indirectly as the modulus, the width, and the cube of the thickness.

In the case of the simple flat spring all of these factors are or can be pretty well controlled except the thickness, which is subject to variation due to the rolling conditions previously mentioned, but we find that the thickness has a very important effect on the load, as it enters into the formula to the cube or third power. Thus we find by substituting a variation of plus or minus 5% which is equivalent to one-half pound in the load and finding the equivalent variation in the thickness that our thickness can only vary plus or minus .0015" on a thickness of .065". This is a normal tolerance for rolling this thickness of material, and unfortunately we have no other specifications on the spring which we can vary in order to offset the variation due to the thickness. If we took a similar variation of plus or minus 5% on a spring .010" thick we would find that our variation in thickness would be only .00985" to .01015" or to state it in another way, if we took a variation of plus or minus .0005" on thickness, which would be considered good accuracy on rolling, we would find that our variation was plus or minus 16% on the load test, due to variation in thickness alone.

These variations are even more noticeable in the case of helical springs such as valve springs, but fortunately, in such a spring there are other variables running over and some under so that the average condition is correct within given tolerances. For instance, we have actual specifications for a valve spring as follows:—$2\frac{1}{16}$" long, $1\frac{1}{16}$" mean diameter, with 7¾" coils of .162" wire. The loading requirements would be 30.25 pounds plus or minus one pound at 2", 61.5 pounds plus or minus 1.5 pounds at $1\frac{1}{16}$".

The unit load varies directly as the fourth power of the wire diameter and the modulus and indirectly as the number of coils and the cube of the mean radius. To figure then the amount of tolerance which is allowable on each of these dimensions to correspond to the tolerance allowed on the load test we find that we are allowed .001" tolerance on the wire .010" tolerance on the diameter of the spring, one-seventh of a coil on the number of coils, .015" tolerance on the length. To show how close these tolerances are, it is only necessary to say that the ordinary ac-

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The ULTIMATE in DIMENSIONAL LIMITS as APPLIED to GAGES

By HARRY LOVENSTON

MEMBER A.S.T.E.

Editor's Note: Detroit Chapter of the A.S.T.E. has had a "Speakers' Club" for years. It is the purpose of this club to provide an opportunity for public speaking, as well as the tutelage of a professional instructor in that field. At a recent regular monthly meeting of Detroit Chapter several interesting papers were presented of which the following are typical.

THE requirements of accurate measurements are growing more rigorous every day. Years ago measurements within one thousandth of an inch were considered rather phenomenal, but gradually became one of the requirements in accurate machine work. Then followed measurements which were relied upon to be within one tenth of a thousandth of an inch, which was a great step forward. Today we have means for measuring which are reliable to within a few millionths of an inch. Recently, there appeared an advertisement in one of our current weeklies which read, "Scrapped, because five millionth parts of one inch out of round." Reference in this case was made to a die for drawing the fine filament wire used in incandescent lamps.

Not so long ago such limits were unheard of except in the laboratory, but today we encounter them in shop practice. Uncertainty in establishing accurate measurements within such small limits as five millionth part of an inch has been entirely eliminated.

Most of our measurements today are made by comparison. For this purpose very ingenious instruments (Comparators) have been developed. Some of them have an amplification ratio of 20000 to 1. One ten thousandth of one inch is equal to a two inch space on the gage dial. If this space is subdivided into 20 equal parts then each space of the subdivision would be one tenth of an inch and equal to five millionth of an inch. It is obvious then that closer readings can be obtained if so desired.

Instruments of such extreme precision would not be here had it not been for the high degree of accuracy of the precision gage block, which we can truthfully call the "Master of Masters." Gage blocks are made to such great accuracy that they very closely approach dimensional perfection. Mechanical means for measuring such high degree of dimensional precision would not be reliable and therefore a method is used which is constant and devoid of minute errors which are impossible to correct in mechanical instruments.

Let us dwell for a moment on this important phase which enters into the production of the precision Gage Block.

The first proposed standard was the length of a pendulum which vibrates seconds at Paris.

This pendulum consisted of a steel bar into which were fastened two knife edges, one on each end. A heavy bob was so adjusted on the bar that the period of oscillation was equal to one second when suspended from either knife edge. The standard length was then defined as the distance between the two knife edges. It was found on trial that the errors of measurement were considerably greater than expected and therefore this standard was abandoned.

The second proposed standard was the meter the length of which was to be one forty millionth part of the earth's circumference. It proved, however, as a result of several costly investigations, that the measurements of the earth's circumference vary among themselves by a quantity even greater than those reached with the pendulum and was therefore too inaccurate to serve. In consequence of these variations it was decided that the standard meter should be defined as the arbitrary distance between two lines ruled on a bar of platinum iridium alloy.

This standard of length is kept under lock at the International Bureau of Weights & Measures near Paris, France, and is inspected only once in ten years. Although every precaution may be taken to insure the safety of this arbitrary standard it is certainly not safe to rely on its permanent accuracy, when considering quantities to the order of one millionth.

In searching for some permanent unit of length of constant value, so that the standard meter could be reproduced or checked, the wave length of light was found to possess the desired qualities for this purpose. Among the hundreds of radiations examined none answered the requirements so well as the red radiation of cadmium vapor. The length of the light wave of this radiation under proper condition has proved constant and reproducable at will with an error of less than one part in two million. Great efforts are made today to adopt the wave length of light as the legal standard.

In 1892 the late Professor A. A. Michelson, one of the greatest physicists of our time, completed the evaluation of the meter in terms of the wave length of light. The value found is, one meter—1,553,163,5 wave lengths of the red radiation of cadmium vapor. The precision of this result is better than one part in two million and it represents one of the most precise physical measurements ever attempted.

The instrument which was used in the successful and historic investigation is known as the Michelson interferometer. It is of great precision for measuring distance in terms of the wave length of light and embodies a practical application of the phenomenon of light interference whereby extremely small movements can be observed and measured.

In the production of precision Gage Blocks the interferometer occupies a position of great importance. With the interference method the planeness and parallelist errors can be measured and the length of Master Gages determined by direct comparison with the standard light wave with an uncertainty of not more than one part in four million. The use of this instrument is of scientific nature requiring considerable time and complex mathematical calculations and for this reason this method is confined to Master Blocks only. All commercial checking for length and parallelism of other gages is determined by comparison with the calibrated standards. This simple and reliable method makes it possible to check gage blocks on an economical basis without sacrificing the precision of the interferometer.

The instrument used in this comparative process is the optical flat, which consists of a glass disc with two exactly plane surfaces. The outward appearance of the optical flat in comparison with the interferometer could not be of greater contrast, the basic principle involved, however, is the same. Measurements in both cases are obtained by producing the phenomena of light interference.

The comparative method of checking with optical flats was first applied by Dr. C. G. Peters of the Bureau of Standards in Washington.

Optical flats have found a permanent place in many manufacturing plants, for measuring the planeness of a surface or measuring size and parallelism by comparison with a master. Measurements within five millionths of an inch can easily be obtained. But in order to apply this method it is well to understand the theory on which it is based.

Light is a form of wave motion. The color of light, ranging from .0000169" for the average violet ray to .0000268" for the red rays. Daylight is composed of all colors which vary between the previous mentioned color range and has an average wave length of .000020 of an inch. In order to

obtain measurements it is necessary to use a light, the wave length of which is known accurately. The numerical values of the length of light waves of different colors have been established with great precision and therefore we make use of a monochromatic light that is a light where one color predominates. When an optical flat is placed on a flat reflecting surface under a monochromatic light, it will be noticed that light and dark bands cross the surface. These light and dark bands are created through light interference caused by a slightly tapered air-film which remains between the surface of the optical flat and the surface of the work. These dark interference bands are in all cases onehalf wave length apart and take direction at right angles to the slope of the air-wedge. The interference bands are straight, parallel and equidistant apart if the surface is flat, irregular spaced and curved bands indicate by what amount the corresponding surface area of the work is out of plane.

While the flatness of a surface can be detected with one optical flat it is necessary to use two when checking for length and parallelist. The master and the part to be checked are wrung on one optical flat while the other is placed on top. The relative position to each other of the interference bands which appear on the surface of the master and the work makes it possible to

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APPRENTICE TRAINING

By FLOYD W. EATON

MEMBER A.S.T.E.

APPRENTICE training should and very often does constitute an important function in the metal trades' industries, especially those that employ skilled designers, draftsmen, tool and die makers and machinists. Many firms have learned that it is not always possible to obtain necessary skilled help in the open labor market and consequently they, through apprentice training, can take care of their future skilled labor requirements in this manner. It is either through the lack of facilities or disregard of foresight or hesitancy or other reasons that they fail to train apprentices. Firms in this category are usually up against it for skilled men in busy times and have to bid high for the necessary skilled laborers and sometimes are not able to obtain them.

Apprentice training was severely neglected during the last depression by many firms who found it necessary to retrench and fight for an existence but of late the efforts of wide awake industrial trade associations, educators and plant management have given new life to this training. It is more solidly established now than ever before. As the result of the scarcity of skilled men that was recently felt, and even now, during what has been termed a recession, I doubt that any firm has a surplus of trained men who are reliable and qualifed for positions of greater trust and ability or in an executive capacity. This last statement is apt to be misunderstood but I will dwell on what should be a very successful procedure for training. It consists of a four year course and should to within a few millionths of an inch. work very well in a fairly large plant. What I shall describe consists of good points taken from well established courses and used by many large and well known establishments.

The program is divided into six major functions; namely,

1. Selection
2. Placement and approval of mechanical ability
3. Training schedule
4. Education
5. Records
6. Graduation

I will touch on these functions briefly starting with—

Number one — Selection. Selection should be made from written applicants filed by young men who are living with their parents or responsible guardians and should be graduates of the local high schools. Applicants having had some vocational training usually qualify as the best, for they have an idea of what the inside of a shop contains and requires. They must be physically fit, especially in regard to eyesight. No boys except those having serious intentions of finishing should be considered. Boys disliking mechanics seldom become successful engineers or successful in engineering work. They generally wind up as "a square peg in a round hole," and become a discredit to the organization as well as to themselves.

Number two—Placement and approval of mechanical ability. These requirements suggest that a boy be so placed that he may be observed in a mechanical atmosphere as an errand boy in a tool room, machine shop or drafting room. If he shows an interest in the equipment and asks questions relative to the same and conducts himself in an orderly manner, it may be assumed that he is interested and merits a probationary trial. This trial may be made in the drafting room, having him make simple drawings, or he may be placed in successive order on the lathe, shaper, milling machines and at the bench assigned to simple work for a brief period, depending on ability. Thus if the novice reacts properly and develops ability along the required lines of the trade, the trial is justified.

Number three—Training schedule. The course of training consists of an amount of training on the various occupations relative to the trade in question. Production work under old shop conditions provides very good training during the first year, since it is on production that tool problems really begin. Practical training is available on production; however, apprentices should only be kept on production to master the general requirements. He should follow the work as it proceeds through the shop, such as, from screw machine to heat treat and then to grinding; draftsmen apprentices having trained in this part properly.

Number four—Educational program. This should consist of a practical mathematical beginning with fractions, a course in mechanical drawing, and the exact shop practice should be supplemented with inspirational and mechanical talks by plant executives with special stress being made on character building. Character is an important asset which must be considered in any occupation. The educational program requires four weekly practical instruction periods and should be held on company time.

Number five—The necessary records should include in addition to the personnel record a form upon which all vital information is placed weekly such as the hours worked, record of rates, occupation, school grades, etc. A permanent record is necessary as direct reference is required to keep record of the training account. After a successful completion a copy of a contract containing a working schedule and stipulated rates is signed by a company executive, the parent or guardian, and by the apprentice. It is a three sided agreement; one for the company and the others given to the apprentice and when he becomes twenty-one years of age the contract is renewed by the company and the apprentice only.

Number six—Graduation. This comprises of an interview where is ascertained the type of work suited to the graduate, with a discussion of the graduation rate to be paid, then he is usually presented with some sort of bonus. Some firms give a cash bonus, others present a kit of tools. The graduation certificate is signed and presented; thus ends the interview. The graduate should be followed thereafter and given an opportunity for further training and guidance which is necessary for advancement; this should be given those worthy of consideration. If one will take the trouble today to check the qualifications of the captains of industry, he will learn that most of our big men started on the strength of a foundation laid by apprenticing.

HELICAL GEARS

By MAHLON M. MACHETT
MEMBER A.S.T.E.

DUE to the accuracy and refinement required in the present day manufacture of gears, particularly helical gears, we feel it expedient at this time to bring to light some basic fundamentals, to be perused and turned over in the minds of those whose duty it is to produce gears, in any quantity, of a quality which tends to promote accuracy, quietness, and stamina.

In the last 8 or 10 years giant strides have been made, both in design and in methods for machining gears, and we must all agree that the swing from spur to helical type gears by automotive and machine tool builders has been a most outstanding improvement. As a result of this excellent move on the part of the designing force, it immediately started the brilliant minds of the country devising new and more accurate machinery for producing gears that would check up closer to theoretical perfection.

As a secondary result, it was found that in order to satisfy themselves the gears produced on this latest machinery really were more nearly perfect than ever before, they must have essentially new and minutely accurate testing instruments, for checking the gears produced. This circumstance was readily taken care of in a very efficient manner, by the gage and instrument makers who supplied the demand with some very wonderful tools, which could be used to measure the various elements of a helical gear to the "Nth" degree of accuracy.

At this point it is necessary to retrace our steps a little, and getting back to the state of affairs where we feel that with this new gear cutting equipment we have produced very accurate gears, and are now ready to heat-treat them for hardness, in order that they will give long life.

Heat Treatment

Now giving all credit to the metallurgist and heat-treating specialist, we agree that they have done wonderful things to reduce fire-distortion to a minimum. But, sorry to say, we all realize that gears do not come out of the fire exactly of the same accuracy of form as that with which they went in. This particular fallacy is provided for in possibly 95% of the cases, because grinding stock is allowed on the essential surfaces, hoping that it will be possible to hold the gears in such a manner that these essential surfaces such as the bore, the faces, the hub diameters, the cones, etc. may be ground true and concentric with the teeth, so that when the gears are mounted in their respective positions, they will run accurately and quietly. Therefore, in order to bring out the specific points of "so-called" accuracy, let us dwell for a little on the question of distortion.

All we can say is that, "It is possible, but by no means probable" that a gear will either expand or contract uniformly on all dimensions, or be uniform in different places of like dimensions. This we believe to be caused by non-uniformity existing, either in the steel structure, or in the heat-treatment, or in both. Nevertheless, non-uniformity exists in every heat-treated gear at least to some extent, and in most cases there is considerably more than is realized, or wanted. Now let us apply this matter of non-uniformity particularly to the tooth-spacing and Helical angle of the teeth.

If, for example, the tooth spacing has increased very slightly, say .0002" average per tooth, half way around a gear of 30 teeth and possibly has stayed nearly normal or contracted a little around the other half of the circle, this means that No. 1 tooth and No. 15 tooth are .003" or more further apart, measuring around the pitch circle of the gear in one direction, than they are by measuring around the other direction. This being the case, we may consider that No. 1 tooth is at retard and No. 15 is in advance from their true circumferential positions, or that a line drawn through the center of No. 1 and No. 15 teeth will pass through a point .0015" along side of the theoretical center.

"Noise"

Supposing this gear is finish ground in the bore, in such a manner as to be

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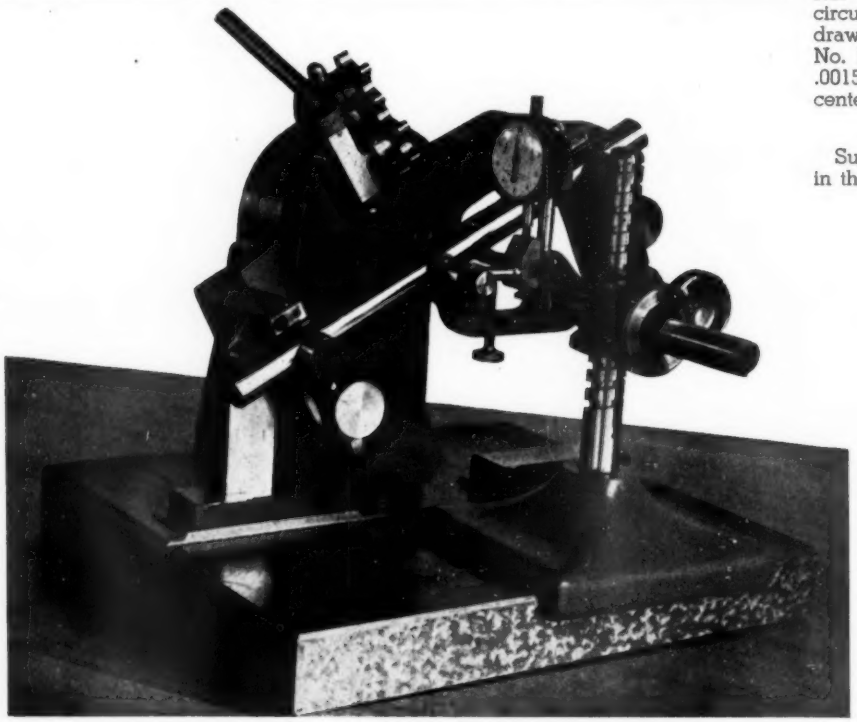

Gear measuring instrument, invention of Mahlon M. Matchett author of this article, which checks the actual essential angle where the bearing between mating teeth occurs. The author feels that this is the only way to get at this line of contact which lies in the line of action at an inclination equal to the base helix angle. This provides therefore the only true precision measurement of these surfaces.

Production Perspectives

NEWS OF MASS MANUFACTURING FROM EVERYWHERE

MID-WEST

Officials of the **Simplex Radio Co.**, Sandusky, **announced** May 19 that the company's **payroll will be doubled at once as the result of orders which will keep the factory busy until March 1, 1939.** With 225 employees in the plant, the list will be increased to 450 immediately, the company said. Expansion of the number of workers followed signing of a union contract, officials reported. The company manufactures radios for autos and mail order houses.

Restoration of proper incentives to private enterprise would release a Niagara of funds that by comparison would make the Government's "pump-priming" program insignificant, according to **Charles R. Hook,** president of the American Rolling Mill Co., and head of the business men's committee cooperating with the Administration to end the recession. A speaker at the annual business meeting of the American Foundrymen's Association in Public Hall, Cleveland, May 18, **Mr. Hook urged the industrialists to support a seven-point program, which, he said, carried the necessary "punch" to restore business activity in America as "quickly as we can mobilize our support." The seven points outlined by Mr. Hook were: Constructive steps by Government to create confidence in the fundamentals of the private enterprise system. Declaration by the** Federal **Government that it will not proceed in competition with private** utilities **and will refrain from practices which retard public utility expansion by discouraging investment and purchases. Prompt solution of** the underlying **railroad problem. Avoidance** of new **federal reform** legislation **that will result in a fresh period of uncertainty. Cooperation between all groups to increase national income. Adequate definition of specific purpose in the appropriating of further national funds** for relief purposes, **with relief funds administered by experienced local agencies to prevent waste of taxpayers' money. Revision of the Wagner Act** so as to make it a workable instrument for the curtailing of labor disputes. Mr. Hook also referred to home building where, he said, Government and **private surveys indicated a need of 70,000 houses a year for the next five years to house adequately the population. This would provide, directly and indirectly, for the employment annually of 2,275,000 additional men** over the five-year period. **To carry out the seven-point program, Mr. Hook stressed the necessity for forcing responsibility on labor organizations, separation of functions of fact finding, prosecution and judicial decision and establishment of impartial administration by the National Labor Relations Board.**

William A. Purtell, President of The Hold-Krome Screw Corporation and President-Treasurer of The Billings & Spencer Company, elected president of The American Supply & Machinery Manufacturers' Association at the joint annual Convention of The National Supply & Machinery Distributors' Association, The Southern Supply & Machinery Distributors' Association, and the American Supply & Machinery Manufacturers' Association held at Pittsburgh. Mr. Purtell succeeds Mr. Roger Tewksbury of The Oster Mfg. Co., Cleveland.

Mr. Purtell is a member of The American Society of Tool Engineers, The American Society for Metals, The National Industrial Distributors Foundation, The Wire Association, The Hartford Engineers Club, The Hartford Club, the Rotary International, and the American Legion.

With **aircraft in this country running about 40 per cent ahead this year of last, two Cleveland companies manufacturing exclusively for the airplane market are busily engaged in supplying their products to meet the growing demand.** One is the **Pump Engineering Service Co.,** which makes fuel pumps, pumps for pulsating the rubber sleeves to remove ice, pumps for "feathering" the propellors, high-pressure oil pumps and all kinds of pressure and vacuum pumps. The company, which is headed by **William S. Jack,** supplied 15 of the pumps on the Pacific Clipper, each for a different purpose. **Bank indicators,** which show the slant of a plane in flight, **have been manufactured for about 10 years by Emil J. Daiber,** heading the **Aero Instrument Co.** Both companies are bright spots in the Cleveland industrial picture.

Westinghouse Electrical & Manufacturing Co. **has announced a readjustment of salary base rates. The new level is 90 per cent of salary rates prior to June 1,** and was effective on that date. **The revision affected 13,000 salaried employees including all executives** It did not apply to hourly paid employees, many of whom had already received reduction of income through reduced hours of work. **The change in base rates did not change the operation of the Westinghouse wage and salary plan. By this plan all employees in good times receive additional compensation each month based on the average earnings of the company for the preceding three months.**

Esco Engineering & Sales, Inc. announces the appointment of two new Sales Agents and Distributors. **Conrad O. Hersam,** Industrial Consulting Engineering Co. 1761 St. Paul St., Philadelphia, has been appointed to sell Esco Drill Jigs and fixtures in lower New York State, Delaware, Maryland, New Jersey and Eastern Pennsylvania. **Hal Reynolds,** 3346 Superior St., Cleveland, Ohio, representative for Taft-Pierce, Colonial Broach and various kindred products will sell and represent Esco in the State of Ohio.

The **appointment of Floyd C. Kishline as assistant chief engineer of Willys-Overland Motors,** Inc., **announced at Toledo in May by David R. Wilson, president,** brings another nationally known figure to the group of executives who have been added to the Willys forces since the first of the year. Kishline, formerly chief engineer for Graham Paige Motor Corp., is chairman of the Detroit division of the Society of Automotive Engineers and has for many years been prominent in the motor car industry for his work in developing maximum power output from automobile engines at the most economical operating costs.

Savings of $3 per body are obtained by the Hudson Motor Car Co. by use of plain butt welding by the electrical arc process in place of conventional spot welding and soldering, according to information recently disclosed by Hudson officials. Though just revealed, **the method has been in use for three years.** Butt welding is done in jigs. **The roof panel and rear quarter panel** are clamped in position **with the edges of the panel abutting.** Two **arc welding operators working on the inside, apply metal in one pass of the electrode,** obtaining 100 per cent penetration through the joint. The seams require only slight tinning to assure smoothness for finishing. The savings include economy in cost of solder plus the various operations of tinning, forming, removing excess solder and polishing the surface for finishing. **The welding is done by an arc process with an electrode made by the Lincoln Electric Co. of Cleveland.**

Rounding out four months of uninterrupted full-time production, the American Bantam Car Co., Butler, Pa., shut down the production April 22 for two weeks for plant improvements and enlargements. Present capacity of the department had been reached. The chassis division, which is capable of producing 200 units a day, has not been changed.

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CHAPTER DOINGS

BALTIMORE

J. J. Buckley, Publicity Chairman
5303 Elsrode Ave., Baltimore, Maryland

On May 9th, members and their friends from Baltimore and the vicinity visited the "Home of Light Electric Tools," The Black and Decker Manufacturing Company, located in Towson, Maryland.

In groups of ten we were conducted through the plant by officers of the company and members of their tool design staff. Due to the great variety of parts that go to make up the many products such as: Electric Drills, Hammers, and Valve Grinding Units manufactured by the Black and Decker Company, the tour presented a wealth of ideas in design and high speed production methods.

Our line of march started in the tool room and then on to the Punch Press Department, where we witnessed the first operation in the fabrication of parts for the electric motors; the blanking of the armature and field laminations to the tune of 200 per minute, with a most ingenious device mounted beneath the press for stacking the segments as they were fed from under the punch.

The Armature Assembly Department was next in line. Here the armature and field lamintaions were pressed into units, and these in turn, were then insulated and placed in special winding machines. Nodding heads moved in unison trying to follow the movements of the winding and field wrapping machines. The Static and Dynamic balancing machine also attracted much attention, as well as many other special devices that kept the members buzzing with questions.

From here the trail led to the Machine Shop where we observed batteries of new Gridley Automatics, Centerless Grinders, Thread Grinders and Gear Cutters all working at top speed, each contributing with the greatest degree of accuracy in the manufacture of products that are known throughout the world.

The men in charge of the various groups as well as the foremen in all departments answered questions in a most proficient and enlightening manner. In all it was a well arranged program for which we extend to Mr. Fox, Plant Superintendent, a unanimous vote of thanks from all Chapter Members.

Meetings during the vacation months are to be discontinued in favor of summer activities which are being planned by the Entertainment Committee, comprising Mr. Kost, Mr. Sheeley and Mr. Shipley. Plans for the first annual picnic to be held sometime in June will be announced in the near future.

BRIDGEPORT

H. J. DeAngelis Secretary

The members of this chapter at the May 12th meeting learned what precision boring really is in a talk by Mr. Guething of the Heald Machine Co.,

Mr. Guething demonstrated with slides showing various set-ups, some showing precision boring of connecting rods held to one tenth of a thousandth. He practically took the audience's breath away when he told of an incident where some work was rejected because it was ten to twenty millionths of an inch out of size. Mr. Guething told of the extreme close tolerances required by the refrigerator industry and how gaging is done in air conditioned rooms with electric gages. A lively discussion followed the talk.

The speaker was introduced by Ben Page, the guiding genius of the Bridgeport Chapter. Cliff Cassidy had a tough time wrestling with the projector as he is only familiar with the simple Bullard Mult-Au-Matic.

BUFFALO

Ernest M. Dildine
Chapter Publicity Chairman

The regular monthly meeting of the Buffalo Chapter was held May 9th, at the Buffalo Trap and Field Club. The speaker for the evening, Mr. Ham Ernst, Research Director of the Cincinnati Milling Machine Co., who was introduced by Mr. Howard Taylor, Chapter Chairman, was presented through the courtesy of Henry Prentiss & Company. Mr. Ernst's subject was "Hydraulic Applications in Machine Tools." Slides were shown of the various types of Machine Tools which are hydraulically operated, and were explained in detail. He then took us behind the scene where we were shown sketches of hydraulic circuits from the beginning down to what is in use today on some of the more complicated machines.

This was a very interesting subject as was shown by the numerous questions that were asked.

Those of us who were fortunate enough to be able to attend this meeting, gained some very valuable knowledge of the application of Hydraulic Circuits to machine tools.

CHICAGO

E. A. Smith
Chairman of Editorial Committee

The first annual golf tournament sponsored by the Chicago Chapter of the A.S.T.E. will be held on June 18, 1938 at the beautiful Hillside Golf Club which is located on Roosevelt Rd. about ½ mile west of Manheim Rd. in Hillside, Illinois. The tournament is open to A.S.T.E'ers and their friends and will last all day, so you may come out at any time during the day. Frank W. Gallant, 7208 South Park Ave., Chicago, is in charge of the details. Come out for a day of fun with your fellow A.S.T.E.'ers. The charge will be the nominal sum of seventy-five cents per person.

Chicago Chapter at its last meeting, was host to our Executive Secretary, Ford Lamb. Mr. Lamb spoke briefly about the A.S.T.E., its development, and the future of the Tool Engineer in the present political and economic turmoil. Mr. Lamb's ideas shed a new and different light on our troubled situation.

After Mr. Lamb's talk, Mr. Kooyman introduced the speaker of the evening, Mr. Birkebak of the Excello Tool Corp., who spoke on "Applications of Diamond Boring." Mr. Birkebak's talk and slides were very interesting to the members.

CLEVELAND

C. J. Hawkey, Publicity Chairman
Penton Bldg., Cleveland, Ohio

Mr. F. D. Bowman of The Carborundum Company by means of motion pictures turned back the clock for the Cleveland Chapter of the A.S.T.E. Tuesday evening, May 10th, to a day 47 years ago when Dr. Edward Goodrich Acheson fused together by means of a carbon rod a handful of clay and coke in a small crucible to produce the first carborundum which today is one of the most useful servants of Industry. The first Carborundum was scarce and costly, selling for $880.00 per pound and was used for Gem Cutting only, whereas today the Carborundum Company produce 1,500,000 pounds per month, employing 3,000 people.

The abrasives of which there are two, the Silicon Carbides for low tensile strength materials and Aluminum Oxides for high tensile materials, are produced under temperatures of 4,000 Deg. F. and are fired for 36 hours to a charge. These abrasives are then crushed and screened to grit size, after which they are bonded together with Synthetic Resins or Ceramic Clays, depending on the type of service for which they are intended. This composition is then pressed to shape and fired for as long as two weeks in zone controlled furnaces, after which the wheels are trued up and each wheel over 8" diameter is tested for speeds 50% higher than normal operating speed.

The Carborundum Company produces all kinds of abrasive cloths and papers, also grinding wheels as small as those used by your dentist up to wheels weighing 9000 lbs, which measure 5 ft each way. These wheels have been used to remove as high as 25 lbs. of metal per hour.

The uses of abrasives are as wide as Industry itself and are used for materials as soft as whale blubber, where it is used for shredding, to the hardest and toughest of the cemented carbide tools, and they have brought precision into mass production by grinding.

It is quite evident that The Carborundum Company has found the answer to a Tool Engineer's dream—a tool that is so universal that no one person or group of persons has ever exhausted its uses or possibilities. What wouldn't a Tool Engineer give to be able to design a jig or a fixture with those characteristics?

DAYTON

Walter Olt, Secretary
R. R. No. 2, Box 304, Dayton, Ohio

A.S.T.E. Chapter No. 18 was chartered at Dayton, Ohio, May 6, 1938 at an organization meeting at the Hotel Gibbons. Mr. Earl Johnson had been instrumental in the preliminary work of organizing the Dayton Chapter, and introduced Mr. Ford R. Lamb, Executive Secretary of The Society, who explained the organization, its functions, purposes and aims. Mr. Charles F. Staples, National Secretary, of The American Society of Tool Engineers, was also present and explained in some detail the various details of chapter operation benefits to local chapters. Membership applications were then received and the meeting was opened for the election of officers. This election resulted as follows: Mr. Earl Johnson, Chairman; Mr. George Goodwin, Vice-Chairman; Mr. Walter Olt, Secretary; Mr. Ray Bleicher, Treasurer.

The officers were duly installed and the charter was presented by Mr. Lamb. A copy of the constitution and by-laws was also presented to the group, as well as a copy of the financial statement of the National organization, a book of the Corporate records, a minute book, membership book, a quantity of stationery, emblems and other supplies, with complete instructions to the newly elected officers.

At this time Mr. Earl Johnson, Chairman, thanked the organization for honoring him as its first Chairman and briefly outlined plans for the chapter. He also called a meeting of the newly elected officers immediately following the group gathering. All present expressed their appreciation of the efforts of Mr. Lamb and Mr. Staples in assisting with the organization of the Dayton Chapter. A motion was made to hold open charter membership in the Dayton Chapter until May 28 for the purpose of obtaining as many charter members as possible. This motion was carried.

All A.S.T.E'ers everywhere join in wishing the Dayton Chapter success and we hope to hear much more from Dayton Chapter No. 18.

DETROIT

J. F. Gilliam, Publicity Chairman
1604 Holden Ave., Detroit, Mich.

The high light of the meeting of May 12th, 1938 was an inspection tour of the Glass Making and Plastic Moulding Division, and the Ford Trade School of the Ford Motor Company.

This tour started in the famous Ford Rotunda in Dearborn, Michigan. After viewing the various commercial exhibits housed in the Rotunda, the boys were piled in busses provided by the Ford Co., and whisked to the Ford Trade School located in one of the factory buildings. Literature was passed out at the school explaining its purpose and how and why it was organized. Briefly the purpose of the school is to give needy boys an opportunity to support themselves and retain their interest in education. To accomplish the first purpose, each boy is awarded a cash scholarship which is paid to him regularly. All equipment in the school, class rooms, machine shops, etc., is of the very best type.

Dinner was served about 7 o'clock in the Trade school dining hall. The steak they served was certainly a credit to the Ford Co. Back in the busses, the next stop was the Glass and Plastic Division. This was quite a sight and should really be seen to be appreciated. This is a complete plate glass mill taking the molten glass directly from the furnace on to conveyors to be laminated (two sheets stuck together with acetate to make shatter proof glass) and ground, ground, and ground some more and lapped and lapped. The Plastic Moulding Department contained about the usual line of machines except on a larger scale.

Returning to the Rotunda Auditorium, the monthly business meeting was started. Mr. Ken Kuhn, meetings chairman of Detroit Chapter, announced the next meeting which will be at Fort Shelby Hotel, sponsored by the Micromatic Hone Co. A complete exhibit of Micromatic hones will be on view.

The speaker of the evening, Mr. F. C. Young of the Metallurgy and Chemical Depts., was introduced by Mr. F. W. Eaton and Ken Kuhn. His speech "Tool Steel Handling and Making in the Ford Motor Company" was highly technical and valuable and concerned various types of steels and alloys made and used by the Ford Company for their own particular use and conditions, Mr. U. S. James, National Publicity Chairman, has asked Mr. Young for a copy of this speech to have printed in either this or some future edition of "The Tool Engineer" if granted permission by the Ford Motor Co.

For this very successful meeting and plant tour, we must thank Mr. F. E. Searle, Director of the Ford Trade School, Mr. R. H. McCarroll, Chief of the Metallurgy Dept., Ford Motor Co., and the Ford Motor Company for transportation and the many courtesies extended to us.

MILWAUKEE

Emmor E. Houston, Chapter Publicity Chairman
1029 South 35th Street, Milwaukee

The Industrial Relations Committee held the spot light at the May meeting of the Milwaukee Chapter, when about 150 members were present. This newly formed committee headed by Mark J. Hennessey, will be a determining factor in the continuation of the successful relationship between the Chapter and Milwaukee industry. Mr. Hennessey asserted that the function of the chapter was primarily for the good of the members, and to maintain this spirit of good will among the manufacturing executives the committee has personally contacted all of the important industrial plants in this area, and set forth in detail the aims and policies of the A.S.T.E.

Chairman Eldred Rutzen introduced Edward Bachmer, of Chicago, Ill., who spoke on "Plastic Materials." After the talk Mr. Bachmer showed a very fine talking motion picture on the history and uses of "Phenol Formaldahyde Materials."

It was originally announced that the annual spring smoker would be held on June 10th but we have since been notified by the entertainment committee chairman, Irvin Schober, that due to the Racine Chapter field day which will be held on June 10th, the smoker has been postponed until the 17th of June, to be held at the Eagles Club. The Milwaukee Chapter extends a hearty welcome to all the nearby chapters to attend our smoker. Members and guests see officers for invitations.

NEW YORK-NEW JERSEY

F. J. Oliver, Publicity Chairman
239 W. 39th Street, New York

Somewhat over 200 members and guests attended the May 10 meeting of the Chapter at the Robert Treat Hotel in Newark where they heard Edward V. Crane, Staff engineer of the E. W. Bliss Co., of Brooklyn, expound on the theory and practice of metal working in presses. The material presented was largely extracted from Mr. Crane's book, "Plastic Working of Metals and Power-Press Operations," published by John Wiley & Son in 1932.

Getting down to the basic theory of the plastic flow of metals, the speaker showed how movement occurs on slip planes between groups of atoms. Referring to the plastic cycle, he showed by an example of spring temper bronze how it could be brought to the dead soft condition by annealing, through recrystalization and rapid increase in grain size, and then by subsequent cold work restored to its original hard condition.

Indicating further effects of strain hardening, he showed by slides how the yield point and hardness of a metal rise at each successive stage of cold working. Getting down to more practical aspects, Mr. Crane illustrated what happens in a typical drawing operation, with the metal plastically rearranged by pulling down the side of the shell and crowding in the area between the blank holder and the surface of the die. A balance was shown to exist between the compressive resistance of the flange and the resultant tensile stresses in the shell wall, imposing a mechanical limitation of 50 per cent reduction in one draw.

Among the many other points raised by the speaker were those relating to press capacity and press failures. In coining operations, for example, through the use of size blocks, much greater loads are developed than is occasioned by the resistance of the piece itself to plastic flow. Mr. Crane also pointed to a trend toward the wider use of cast construction as against welded plate construction for large presses. John Cetrule, chairman of the meetings com-

(Continued on Page 22)

JUNE CHAPTER MEETINGS

Chapter Meeting Announcements must be received on or before the 20th of preceding month to appear on this page. Members and friends of The Society contact Chapter Secretaries for meeting details if your announcement does not appear below.

BRIDGEPORT

June 9, 1938—Dinner at 6:30 P.M. at Barnum Hotel. Meeting at 8:00 P.M.

Speaker: Mr. Roy W. Price, of McCaskey Cash Register Co.

Subject: "Tool Room Control."

There will also be another speaker on Die Castings.

BUFFALO

June 13, 1938—7:00 P.M., Buffalo Trap & Field Club.

Speaker: G. T. Vandermeulen, Surrogates Court.

Reservations: Notify Wm. F. Weinreich, 649 Minnesota Avenue, Buffalo, N. Y., Tel. Un. 9044.

CHICAGO

June 13, 1938—Dinner at 6:45 P.M. (Half) Fried Spring chicken. Machinery Club, 571 Washington Blvd.

Speaker: Mr. Wm. Finkle of A. Finkle & Sons, Co.

Subject: "Characteristic qualities given to steel by various elements such as carbon, manganese, chrome, nickel, etc." "Explanation of the S.A.E. system of cataloging commercial steels."
"Movie showing the production of drop-forged die blocks."

Reservations: Mail reservations to Robert O. Hein, 2243 Lincoln Ave. or call Diversey 1475 before June 9th.

Golf Tournament: Saturday June 18th at Hillside. ½ mile west of Mannheim Road just off of Roosevelt Road. Green Fee $.75.

CLEVELAND

Note: There will be no meeting for June 1938. Meeting in fall, September. Date, time and place to be mailed to members later.

C. G. Sealander, Chairman in charge of meetings.

DETROIT

June 9, 1938—Dinner at Ft. Shelby Hotel, $1.50 for members—$1.75 for guests. Musical entertainment.

Program: Supplied by Micromatic Hone Corp.—Slides and Talk.

Reservations: Contact A.S.T.E. Headquarters, Ty. 5-0145

MILWAUKEE

June 17, 1938—Annual Spring Smoker to be held at Eagles Club, Milwaukee. Members and guests see officers of Milwaukee Chapter for invitations. "R.S.V.P."

NEW YORK—NEW JERSEY

June 14, 1938—Plant Visitation 2:30 P.M. Dinner 5:30 P.M., at Wright Aeronautical Corp. Plant, Paterson, New Jersey.

Speakers: P. B. Taylor, Chief Engineer; K. E. Sutton, Production Manager; Remo Rego, Production Engineering Manager; Wm. D. Kennedy, Service Manager.

Subject: "Engineering, Production and Service Problems of Aircraft Engines."

Reservations: Call Ben C. Brosheer, Medallion 3-0700.

PITTSBURGH

Friday, June 10, 1938—Dinner: 6:30 P.M. $1.10. McCann's Dining Room, Diamond Street, Pittsburgh. Meeting 8:00 P.M.

Speaker: Mr. F. W. Hallam, Tide Water Oil Company, Pittsburgh, Pa.

Subject: "Development of Cutting Oils". Also pictures of Byrd's Antarctic Expedition.

Reservations: Please make dinner reservations before noon, Friday, June 10. Call Miss Wingard, Brandywine 1500, Extension 9378.

Parking: Special rate for parking in McCann's Garage. Same building. Have parking coupon stamped by cashier.

ROCHESTER

June 14, 1938—8:00 P.M., Bausch and Lomb Company (West side of St. Paul Street.)

Speaker: Ivan Nixon.

Subject: "Optical Measuring Instruments".

ROCKFORD

June 18, 1938—Dinner at 1:00, $1.50. A.S.T.E. Golf Stag and Rifle Match at Morgan Golf Course (on the Milwaukee Road, just outside of Beloit) Golf and Rifle Match open to members and friends. Prizes will be awarded to the winners and in the event of rain the outing will be postponed for one week, making it June, 25.

Reservations: Call L. B. Ades, Forest 2350 before June 11.

ST. LOUIS

June 16, 1938—Dinner at 6:30 P.M. at Northside Y.M.C.A., 3100 North Grand Avenue, $1.00 per plate.

Speaker: Mr. C. A. Birkebak of the Ex-Cell-O Corp.

Subject: "Precision Boring".

Reservations: Mail to C. J. Steinman, 2401 North Leffingwell Avenue.

TOLEDO

June 28, 1938—6:30 P.M., Toledo Yacht Club.

Speakers: Dean Palmer and Professor Zarobsky of the University of Toledo.

Subject: Modern Methods of Machine & Tool Design.

Reservations: Dinner $1.00, L. E. Rinnell 206 Crawford Avenue.

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A NEW, COMPLETE, UP-TO-DATE EDITION OF THE

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HANDY ANDY'S ..WORKSHOP..

First off, thanks to Gene Bouton of Racine—and others—for the nice letters; I thought only movie folks got that kind of mail. We'd like to publish some of the plaudits, only the readers get more of a kick when somebody pans us—not to mention the reactions of the editor. But seriously, it has been the aim of the editorial committee to establish and maintain a high standard, both in editorial and technical matter. And, while our editorials are often written with a view to provoking thought and criticism (and we get it) I am pleased with the understanding accorded this matter by our readers. We'll try to improve as we go along.

In my work, as in avocation, I incline to the rule of the old schoolmaster Bruce Barton told about: "Never apologize, never retract; just get things done." That, however, does not preclude explanation. There comes to hand, occasionally, matter that just doesn't fit into our editorial policy, and while some of it is really excellent we just have to turn thumbs down. But, if your poem or funny story doesn't get into print you can bet that Handy Andy and his pals get a big kick out of it, so it's not entirely wasted.

For that matter, we have to pull our own punches too, and we are ardent champion of the freedom of the press. Damn the censors!—only you have to humor them or slip it over so adroitly that they like it. Like the wag who published a book of Mother Goose Rhymes, Censored. As:

"Three wise men from Gotham, went
to—in a bowl.
If the bowl had been stronger, my
tale had been longer."

Now, as diversion, make up your own on Peter Pumpkin Eater or Little Tommy Tucker. Me, I'm going to let go one of these days and write a book, and then! Want to get in on the first edition? Unexpurgated!

Somebody (I forgot who) wrote in asking why I haven't given honorable mention to Bill Hart of Colonial Broach. Good gosh! I didn't think Bill needed any mention, being plenty of a live wire and a somewhat regular (and welcome) contributor to "The Tool Engineer." Anyway, here's to you, Bill!

I'd like to make it clear, at this time, that the Workshop plays no favorites. Usually, mention of names is quite impromptu and often as not I have mentioned a mere stranger merely because I liked the cut of his jib and had a hunch that he had the makings of a comer. And often as not, my hunches have clicked, with the added satisfaction that in some instances a regular guy has been helped along. So let's all give a boost where we can.

Had the pleasure of visiting Hank Ford's li'l shop out at River Rouge the other evening, along with the boys from Detroit Chapter. Something was all wrong with the picture I saw, because, look as I would, nary a slave driver did I see, nor a whip cracked. On the contrary, the boys along the line, busy as they were, had time for a smile and an explanation. They worked smoothly and efficiently, without hurry, fuss or bother; as a matter of fact, the machines did the work—and how!—while the men just peeked now and then to see that no monkey wrenches got in the wheels. And that is my idea of an industrial Utopia, production without over-exertion of workers. Let the machines do the hard work.

We went through the apprentice school, as an added attraction; that alone covers about three acres of floor space, is equipped with a couple of million dollars worth of the best machinery that money can buy. You know, ten thousand small shop owners, their space equal to the Rouge Plant, would not have thought of pooling their resources to train men for the future. But Henry Ford thought of it, as Walter Chrysler thought of an engineering college and the Rockefellers conceived the Foundation. And it all goes to the advancement of humanity, promotes a better civilization.

That the Ford Motor Company is an industrial empire goes without saying. But, certainly the company had to produce something that the masses wanted before it could grow to its present

(Continued on page 22)

CONTINENTAL
★BAND FILER

BRAND NEW . . . and

only $88.00

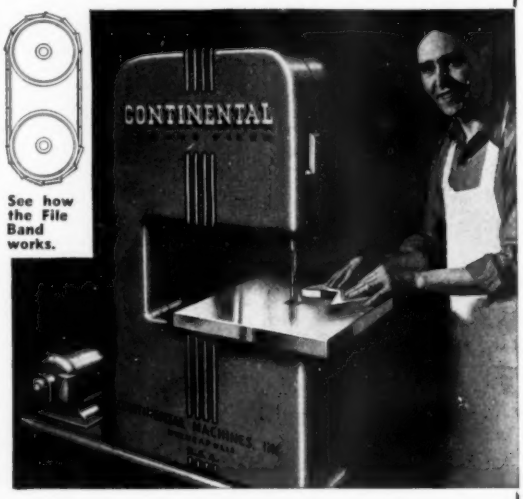
● Just think of this—a really efficient continuous filing machine at a sensationally low price! For faster, better, smoother work on all metals, alloys, plastics, fiber, wood, etc.

The file segments automatically interlock and form a rigid file before they reach the work. Filing is in one direction only, prolonging file life and producing an exceptional job.

13 standard file bands are available for best work on various materials, from toughest high carbon steel to copper, brass, etc.

It's sturdy. Weighs 150 pounds. Portable. Place on any work bench. 32" high. Operated by any ¼ HP motor (not included).

See how the File Band works.



Every machine shop, model and tool room, and metal worker can save time and money with this remarkable performance machine. Get a demonstration from your dealer or order on 10-days Free Trial. Circular on request.

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☐ Send Continental Filer on 10 Days Trial.

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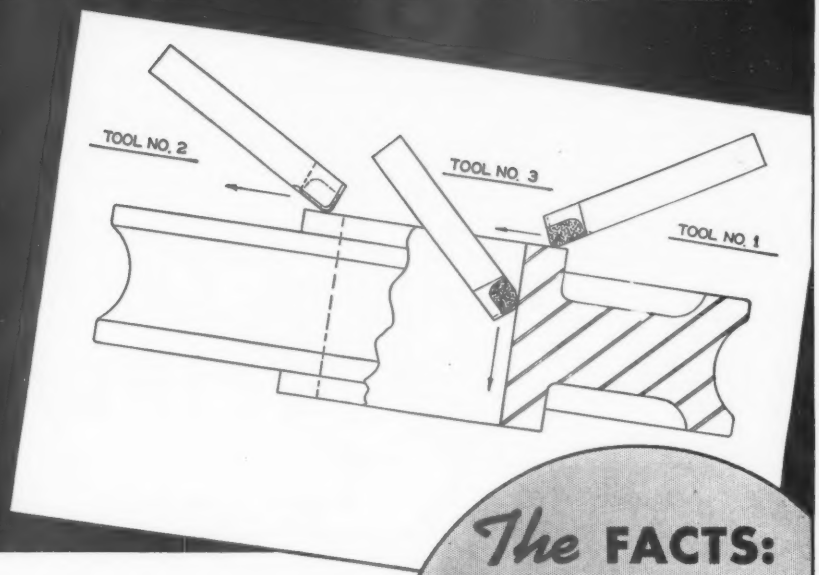
Another CARBOLOY tool set-up that *Paid for Itself* in less than 1 DAY!



User makes PROFIT of $968.23 in 20 days . . . a 6% dividend every 13 operating minutes

Carboloy tools pay for themselves *fast.* You don't wait months or years to get your money back. The "pay-out" period is a matter of days and even hours. Here's a case where the money came back just 3⅔ hours after the tools were started—and kept paying a dividend of 6% every 13 minutes of use:

An Illinois manufacturer was grinding high silicon cast iron sheaves at a cost of $2.65 per piece. Ordinary tools wouldn't touch this metal but here's what they accomplished with $21.73 worth of Carboloy tools (including 2 spare tools and special tool-grinding wheel):

Cost reduced to 67c per sheave. Carboloy tools paid for themselves in the first 3⅔ hours of use—and kept paying a 6% dividend every 13 minutes thereafter. That Carboloy investment of $21.73 piled up a total saving of $968.23 in just twenty, 8-hour days of use. And the tools still have four-fifths of their original life.

Discount these figures 50%*—if you wish—and then *still* ask yourself this question: "When you can make such savings (profits) so rapidly—why wait to tool up with Carboloy?"

You need these savings *NOW* more than ever before!

*(*Note: *Complete facts on this application available on request.*)

The FACTS:

TOOL COST: $21.73, including cost of 2 spare tools and special grinding wheel.

THE "PAY-OUT" PERIOD: Entire investment paid for itself in the first 3⅔ hours of use.

TOTAL SAVING TO DATE: $968.23 profit in just 20, eight-hour days.

Can you afford to overlook these profits today?

CARBOLOY COMPANY, INC.
DETROIT, MICHIGAN

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CARBOLOY
REG. U. S. PAT. OFF.
CEMENTED CARBIDE TOOLS

Carboloy Company, Inc., 2983 E. Jefferson Avenue
Detroit, Michigan

How *fast,* and how *much* additional machining profit can we make with Carboloy Tools on this job?

Name_____ Title_____

Company_____

City_____ State_____

HANDY ANDY'S WORKSHOP

(Continued from Page 20)

proportions, just as other large corporations had to create, then meet, public demand for its goods. That something is service, a very broad term to be sure, yet something very definite and tangible. Now, I am not trying to advertise Ford or anyone else; I am trying to show that wealth, constructively used, reverts to the benefit of the people.

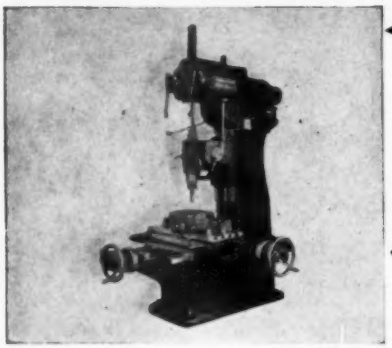
Years ago, John D. Rockefeller was lampooned and impugned, and perhaps he deserved some of it; I'm not the judge of that. All rugged individualists, to call them that, were put on the pan plenty. But, laying in overland pipe lines, Standard Oil cut transportation costs of crude oil, by research and experiment, reduced waste to a minimum. The company spends annually, in research alone, more than the average small corporation could earn, the whole goes back to the consumer in better fuels and lubricating oils, to say nothing of the by-products used for every conceivable purpose.

Concentrated wealth may have its disadvantages, but how much would each of us get if it were divided. And if divided, to what collective use would we put it? The chances are that it would be dissipated, with resultant national bankruptcy. People, generally, haven't learned the knack of cooperation, nor can the many plan constructively as the smaller group. Besides, we're all endowed with different talents; some are acquisitive, some have leadership, some are creative and others productive, and so on. Coordinated—but not regimented—we accomplish great things as a society, and accomplish them the better because of a system that, despite its shortcomings, is conducive to mechanical, social and economic progress.

Well, that's quite a sermon. Having got that off my chest, I'm going to hit the hay and think up something real hot for next issue. You know, I missed out last time, on account of important stuff taking precedence, but I'll be with you again before the roses are through blooming. Best regards.

H. A.

. . CLEEREMAN
DRILLING MACHINES

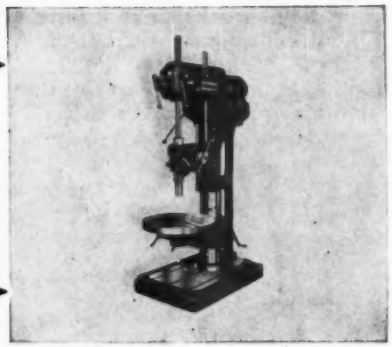


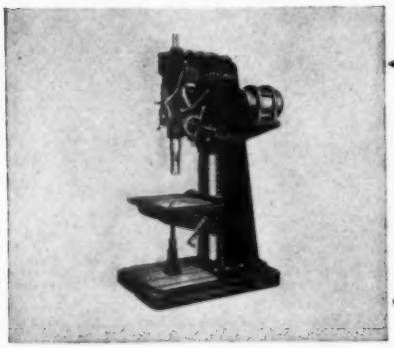
Cleereman Jig Borers

Precision built for jig, fixture, tool and die work. Especially adapted to manufacturing where unusual accuracy is required. Also for experimental work and short run production. They handle drilling, boring, reaming, tapping, and light milling.

Sliding Head Drills

Round or square columns . . . Fully geared . . . anti-friction . . . automatic oiling . . . single lever control for feed . . . single lever control for speeds . . . reversing motor, no friction clutches . . . standard range, 21" to 30" sizes . . . Capacity 1½" through S.A.E. 1035 steel.





Stationary Head Drills

Heavy duty drills . . . all geared . . . automatically oiled . . . Full anti-friction Bearing . . . Furnished with plain or heavy duty compound table . . . no bothersome friction clutches . . . reverse for tapping direct through motor . . . standard range, 24" to 32" sizes . . . Capacity 2" through S.A.E. 1035 steel.

THE CLEEREMAN MACHINE TOOL CO.
GREEN BAY, WISCONSIN

Sales Managed By: Bryant Machinery & Engineering Company, 400 West Madison St., Chicago

PRODUCTION PERSPECTIVES

(Continued from Page 15)

With the resumption of manufacturing, the company started production of a new Bantam commercial trailer.

Business of American Fork & Hoe Co. had a strong upswing during April, it was reported May 5. **Sales have been improving since the beginning of February** after recession lows in December and January. Current **improvement** is particularly **encouraging for a good portion is due to farm buying.** Seasonal nature of sporting goods sales is partly responsible and an increase in

(Continued on Page 30)

CHAPTER DOINGS

(Continued from Page 17)

mittee introduced the speaker. Chapter Chairman Frank Sheeley pointed out that the June 14 meeting would be a closed session open to members only. The chapter is to be the guest of the Wright Aeronautical Corp., who will provide a plant visitation, dinner and talks from a number of staff engineers.

Members and applicants as of June 1 may attend. Apropos of this, Bill Dinger, chairman of the Membership Committee announced that the chapter then had 122 members and 25 applications on hand or at Detroit.

He hopes to see that number raised to 200 by the first fall meeting.

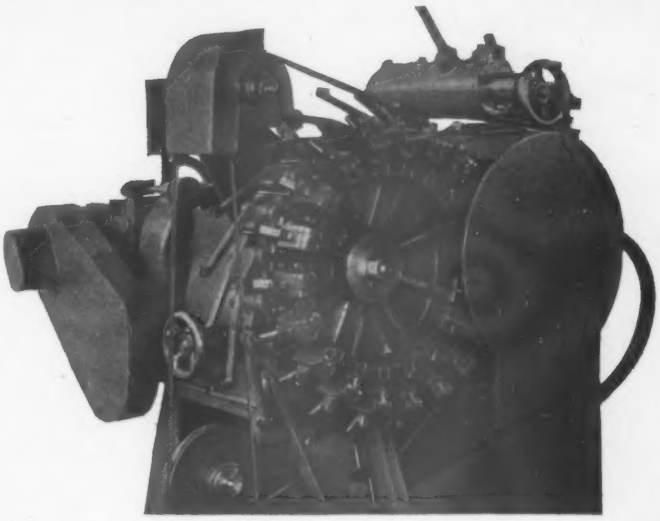
A social affair is planned for June 3 at the Village Barn, where country games and dances are part of an informal program in the heart of New York's own Greenwich Village.

Tom Orchard, chairman of the Entertainment Committee promised a good time for all. Following the meeting, eligible members made the occasion a historic one by signing the chapter charter, granted Nov. 1, 1937.

(Continued on Page 26)

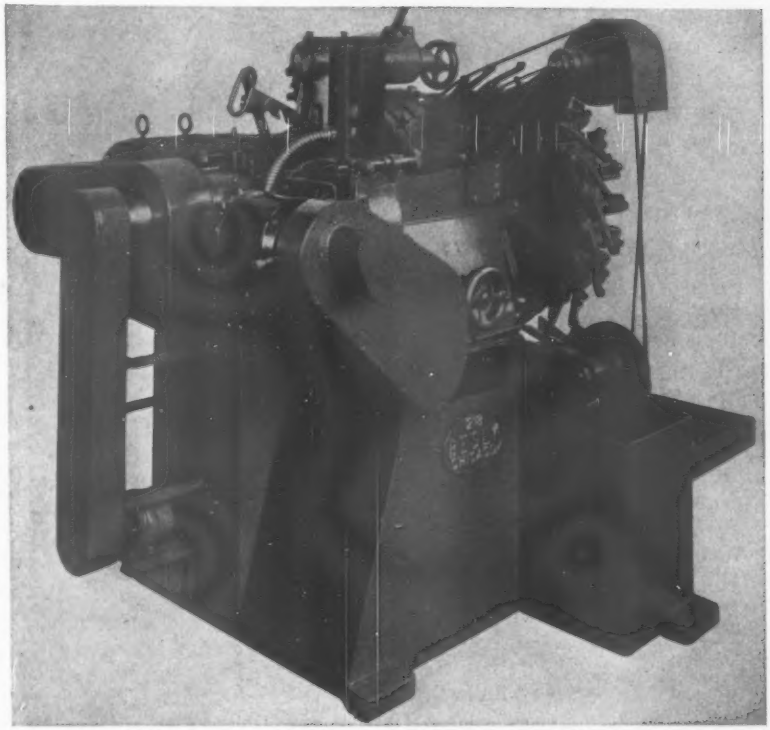
1800 valve stems ground per hour

ON BESLY GRINDER



Illustrations show No. 218—20" Wet Single Spindle Besly Grinder equipped with Rotary Feed especially arranged for grinding ends of automotive valves. ● Operator places valve in work station, the piece is automatically clamped by means of cable actuated lever and drops out of the station by gravity after grinding is accomplished.

● This is one of the many specific purpose Besly Grinders recently developed by us. Perhaps you have some flat surfacing operation in your plant that could be handled to wonderful advantage on a Besly Grinder. Let us have particulars and we will give you the benefit of our long varied experience.



Write for your copy of Booklet on Besly Titan Steelbacs.

● Learn about these bolted-on Discs (with 1", 2" and 3" of Resinoid Bonded Abrasive) which are gradually being adopted by most users of Disc, Surface or Face Grinders.

CHARLES H. BESLY AND COMPANY

118-124 NORTH CLINTON STREET ★ CHICAGO, ILLINOIS

New Literature

of Interest to the Tool Engineer

"Tungsten"

The American Tungsten Association, 111 Sutter Street, San Francisco, California, has recently published a very attractive and interesting twenty page booklet, pocket size, under the title "Tungsten." The booklet describes various tungsten deposits throughout the world showing by map their location and has a series of "Tungsten Talks" by Charles H. Segerstrom, President of the Association. A chart also appears in the booklet indicating the world's production as well as the United States production and prices of tungsten based on the average United States prices in dollars per unit. Figures are also given on amount of tungsten imported into the United States. The booklet is attractively illustrated throughout and should be of interest to Tool Engineers.

"Modern Methods of Gardner-Grinding"

A very interesting bulletin has been issued by the Gardner Machine Company of Beloit, Wisconsin, describing the modern methods of disc grinding with the Gardner Disc Grinding Machine. The bulletin is very attractively printed with many detail and full size illustrations and describes the various types of Gardner machines from the Two-Head, Stream-lined Special Purpose Machine and Double-disc Grinding Machine to the Gardner Precision Disc Grinding Machine capable of grinding minute watch movement parts. Copies of the very attractive bulletin may be had by writing the Gardner Machine Company, Dept. T-E, Beloit, Wisconsin.

"Doubling Production per Hour"

This is the title of a very attractive companion piece of literature issued by the R. K. LeBlond Machine Tool Company, complimenting LeBlond's fiftieth anniversary book "What Makes Main Street." Following the individual treatment of the Main Street book which attracted very widespread attention, this new catalog deals exclusively with LeBlond Rapid Production Lathes. With an outside cover showing the little old mill and energetic dwarfs busily turning out all sorts of products, the story leads interestingly and entertainingly as well as instructively into the details of LeBlond Rapid Production Lathes. From the practical standpoint the book has some interesting pages on different forms of tool set-ups. Both of these catalogs issued by the LeBlond Machine Tool Company represent an entirely new and interesting approach to the machine tool marketing problem. Tool Engineers may obtain a copy, although the edition is now limited, by addressing their reply on their firm letterhead direct to W. L. Rybolt, care of The R. K. LeBlond Machine Tool Company, Cincinnati, Ohio.

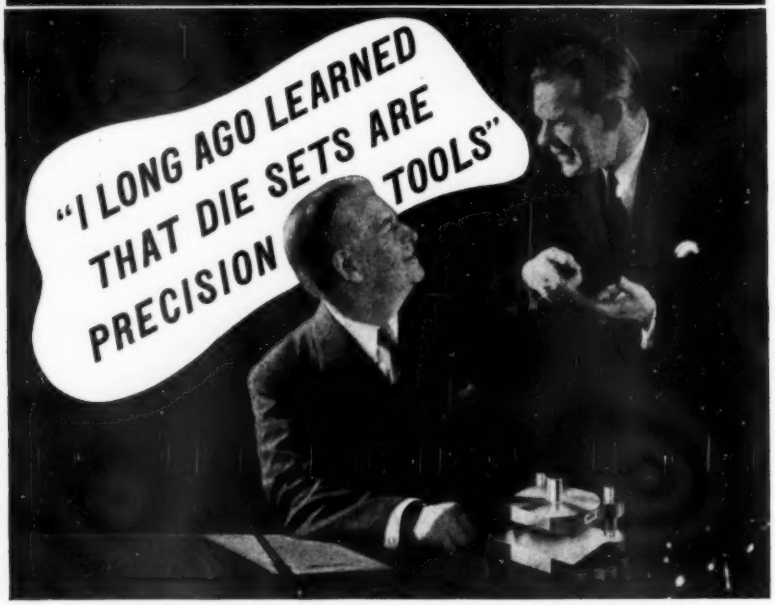
"Let Me Tell You About Machine Tools"

A large edition of a new booklet issued by the National Machine Tool Builders' Association, 10523 Carnegie Avenue, Cleveland, Ohio, entitled "Let Me Tell You About Machine Tools" is of interest to machine tool using plants and is available free on request direct to the Association. The booklet has been written by a machine operator who tells in his own words what machine tools are, what they do, and something about the men who operate them. It is profusely illustrated.

Walton Tap Extractors

A new descriptive folder covering the line of Walton Tap Extractors—specialized tools for the extraction of broken taps, has been issued by the Walton Company, 94 Allyn Street, Hartford, Connecticut. This new folder—for the first time—announces the introduction of three new combination sets, packed in attractive wood cases and offered at special prices. Copies of the new circular may be had by addressing the company direct and mentioning "The Tool Engineer."

PRECISION PAYS



DANLY DIE SETS AND DIE MAKERS' SUPPLIES
From the 8 Danly Branch Office Stocks

BRANCHES:
LONG ISLAND CITY, N. Y. 36-12 34th STREET
DETROIT, MICHIGAN 1549 TEMPLE AVENUE
CLEVELAND, OHIO 1745 ROCKWELL AVENUE
DAYTON, OHIO 990 E. MONUMENT AVENUE
PHILADELPHIA, PA. 3913 N. BROAD STREET
ROCHESTER, N. Y. 16 COMMERCIAL STREET
MILWAUKEE, WIS. 513 EAST BUFFALO STREET

Dies are mounted in die sets for just one reason—to secure more accurate closing of the die on the press.

It's that ± 1/10,000 tolerance between pin and bushing that brings Danly Mounted dies together with absolute accuracy at high speeds.

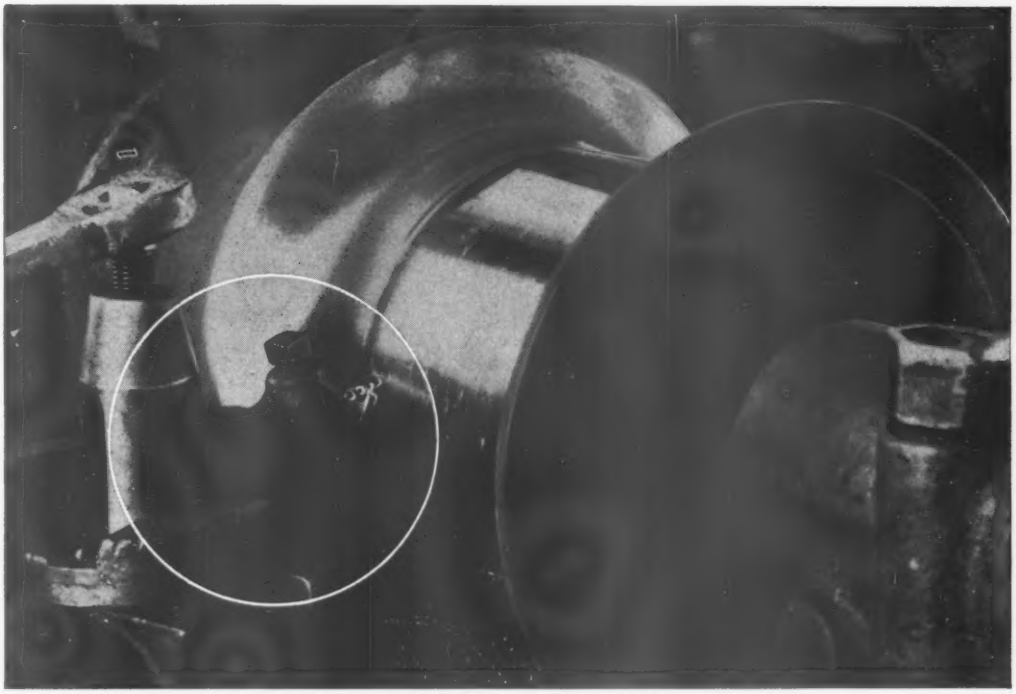
It's that ± 1/10,000 accuracy of Danly Precision Die Sets that eliminates shearing, protects the die, protects production and gives longer life between regrindings.

Precision Pays—it's yours for specifying Danly Precision Die Sets.

DANLY MACHINE SPECIALTIES, Inc., 2114 So. 52nd Ave., Chicago, Ill.

DANLY PRECISION DIE SETS

Haynes Stellite J-METAL machines Manganese Steel under unique cutting conditions



• A 5/8-inch square Haynes Stellite J-Metal tool bit is turning this manganese steel cathead for oil field equipment under unique cutting conditions. Although the cathead is preheated and kept hot with an oxy-acetylene flame during the turning operation, Haynes Stellite J-Metal, being hard and abrasion-resistant even at red heat, machines it successfully.

This is one of the 44 actual production jobs pictured and described in "Haynes Stellite J-Metal Cutting Tools", a new 56-page operating manual telling how, when and where to use Haynes Stellite J-Metal profitably. You may have a copy simply by asking for it. Write today . . . Or ask a Haynes Stellite engineer to call and explain what Haynes Stellite J-Metal can do in your shop. There is no obligation.

PRODUCT OF A UNIT OF UCC UNION CARBIDE AND CARBON CORPORATION

J-METAL HAYNES STELLITE TRADE MARK

A red-hard, wear-resisting alloy of Cobalt, Chromium and Tungsten

HAYNES STELLITE COMPANY

Unit of Union Carbide and Carbon Corporation

UCC

Chicago · Cleveland · Detroit · Houston · Los Angeles · New York · San Francisco · Tulsa

General Office and Works—Kokomo, Indiana
Foreign Sales Department—New York City

Haynes Stellite Welding Rods and information on other Haynes Stellite Products also are available through the 46 apparatus shipping points of The Linde Air Products Company

CHAPTER DOINGS

(Continued from Page 22)

PHILADELPHIA

Thos. J. Donovan, Publicity Chairman
3147 Aramingo Avenue, Philadelphia, Penn.

The Philadelphia chapter A.S.T.E. held its first get acquainted meeting on May 17, 1938 at 6:45 p.m. This gala affair was held in the main dining room of the Cadillac Club, Board & Hunting Park Avenue, Philadelphia.

Its many friends and members turned out far beyond expectations. There were some 200 in attendance, and they were well paid for their efforts of being present.

Chapter Chairman, Conrad O. Hersam delivered an excellent short talk on the purposes and principles of the A.S.T.E.

The attractions and entertainment were many and varied, and under the excellent directions of our entertainment committee headed by Paul Frankfurter and his assistants, with Mr. Ed Glenn serving as song leader sufficed to make the evening one of real pleasure, and I believe will be remembered by all who were present as one of the best get-to-gether and get-acquainted evenings they ever had the pleasure to attend. The evening closed with those present singing "Auld Lang Sang."

PITTSBURGH

J. H. Thomas, Chapter Publicity Chairman
7442 Pennfield Court, Pittsburgh

Mr. R. F. Helmkamp, Service Engineer, Air Reduction Sales Co., presented an illustrated talk, "Management of Machine Cutting Operation with Gas." The forty-seven members and twenty-two guests included Mr. B. D. Edsoll, Mgr. and Mr. P. H. Reagan, Ass't. Sales Mfg. of Air Reduction Sales Co. Mr. Ben C. Brosheer, Ass't. Editor of American Machinist, Mr. P. A. Shaw, Sup't. of Flannery Bolt Co., Mr. G. A. Thompson, Vice Pres. of Brown & Zortman Machine Co., Mr. K. P. Bolston, Engineer Screw Machine Specialty Co., Mr. Geo. M. Harrower, Vice Pres. Brown & Zortman Machine Co.

Mr. J. P. Wiley our Vice Chairman conducted the business meeting in fine fettle. He can certainly handle a lot of important business in a very efficient manner. He appointed Mr. J. R. Weaver, who is to pick his own committee, to act as chairman of the semi-annual meeting of the A.S.T.E. National Directors Meeting to be held in Pittsburgh in October. He called on Mr. Geo. P. Longabaugh who reported for his membership committee five new members. That proves the old saying "Let George do it." Next he called on Mr. Bill Vecker who gave the treasurer report in the absence of Mr. Judkins and we still have money in the bank. Mr. I. M. Dinger was called upon next and he introduced the speaker of the evening. We were glad to see Mr. John E. Rapp who represented the Goodman Co. in the absence of Mr. John Goodman who was away on business. Mr. S. S. Evashavik and Mr. Dave Rennie attended. They have missed several meet ings and the meetings missed them. Mr. E. J. Borgman and John G. Bunker will be known in the future as The Muffin Man. Mr. F. R. Dinger had George H. Mertz, Foreman of "The Robertshaw Co., as guest. He would make a fine member F.R.—We would like to have Carl F. Toperzer bring his brother to the next meeting. He is a member of Detroit Chapter. Why not transfer to Pittsburgh?

RACINE

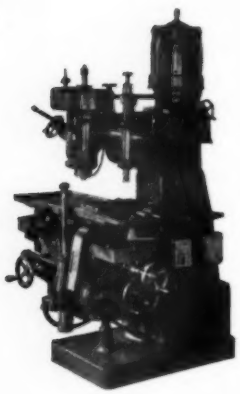
T. J. Santry, Publicity Chairman
1615 Racine St., Racine, Wisc.

Eighty-five engineers and guests attended the monthly dinner meeting held by Racine Chapter, A.S.T.E., April 25th, at Meadowbrook Country Club.

Following the dinner the guest speaker of the evening was Mr. I. J. Snader, Research Engineer of the Ex-Cell-O Corporation, Detroit, Michigan, who spoke on the subject of "Thread Grinding."

He started his talk by stating that thread grinding during the last 15 years has often been mentioned, but heretofore very little has been definitely said about the subject, and the possibilities of thread grinding, it appears, have not been appreciated. The early machines

(Continued on Page 28)



Gorton Duplicators are the most efficient machines for small die and mold production. Write for bulletins on Gorton Die and Mold Machines.

All the plastic parts (bases, mountings, etc.) of Bulletin 9115 Manual Motor Starters, "the 'heart' of the new Cutler-Hammer line", are produced with molds cut on Gorton Die and Mold Machines. For very practical reasons, Gorton Machines are helping to build this new starter of advanced engineering design, and are an essential part of the modern tool rooms of most of the leading motor control manufacturers.

The tool room likes them for their flexibility in all kinds of small mold work, their ease of operation and maintenance, and their facility for producing accurate work with least time and effort.

Management likes them because they have cut deeply into mold costs and speeded up plastic production.

GEORGE GORTON MACHINE CO.
1111 13TH ST., RACINE, WIS.

MAINTAINED ACCURACY

● **BECAUSE JAW BEARING SURFACES HAVE 3 TIMES GREATER AREA**
WITH BEARING SURFACES 5 TIMES AS EFFECTIVE

THE NEW CUSHMAN HEAVY DUTY 2-JAW CHUCK

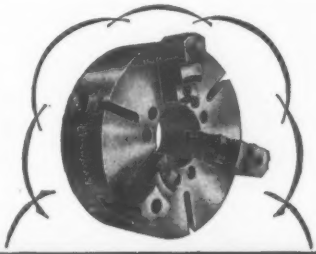
FOR AMERICAN STANDARD TYPE A–1 SPINDLES.

In the design of this entirely new type of heavy duty precision two-jaw chuck, Cushman engineers have once again met the advancing needs of modern heavy production equipment.

The design of these chucks provides a degree of accuracy in centering work pieces that heretofore has not been available.

Unusual features include a steel body with a hardened steel face in which the jaws are enclosed. The jaw holding surfaces in the body are of such large area that inaccuracy due to wear will develop only after years of service, and when such wear occurs it is necessary only to reface. Also, the jaws are supported at the center, under the hardened steel face, so that bell-mouthing of the jaws is entirely eliminated.

The hardened operating screw is held in position with our "Incomparable" Patented Two-Piece Self-Aligning Thrust Bearing. With this screw and bearing design, true contact between the operating screw and jaw threads is guaranteed . . . no thread cutting. A hardened pilot bushing passes through the body for center pilot tooling. The complete assembly is such that the chuck is sealed against chips working into the moving parts.



A special bulletin, No. 183, covering this new equipment in detail will be sent to you promptly upon request.

The Cushman Chuck Company, Chucking Engineers since 1862. Hartford, Connecticut.

CUSHMAN CHUCKS
A WORLD STANDARD FOR PRECISION

CHAPTER DOINGS

(Continued from Page 26)

he stated were mostly, rather crudely built affairs, adapted for the particular work to be accomplished in the plants where the machines were built. Lantern slides were shown illustrating these first thread grinding machines and amongst things he called to the attention of the engineers present were that it could be noticed that no provision had been made for protection against abrasive dust, and that no provision was made for coolant other than the addition of a few sheet metal pans and shelves built around the machine, as an after thought, in order to keep it from running over the floor. Neverthless, he stated, many jobs were ground quite accurately on machines of this old style type.

He further stated that their engineers made yearly improvements on their line of thread grinding machines, which improvements he pointed out in detail as he went along, and he then showed slides illustrating their latest machine redesigned along modern esthetic lines of machine tool design, heavy in construction, and complete with everything to insure fast and accurate thread grinding.

Machines were illustrated doing various grinding jobs from small to large jobs and in talking about each job, Mr. Snader, would indicate the number of pieces being produced per hour, etc. In his discussion he also in detail called attention to the kinds of emery wheels recommended for the various kinds of jobs.

Mr. Snader answered all questions asked from the floor of which there were a great number, and he also had on display a large quantity of finished ground thread parts.

At the close of the meeting and discussion, Milt. J. Schmidt, showed four reels of moving pictures, some of which were colored, which he took on a trip to Alaska last July. During the showing of these pictures, he pointed out the highlights and points of interest.

Mr. Snader's talk and discussion was one of the best given during the present season and with the addition of Milt. Schmidt's movies, it was really enjoyed by all present.

Mention was also made of the annual Frolic to be put on by the Racine Chapter on Friday afternoon, June 10th.

ROCHESTER

C. G. Newton, Publicity Chairman
806 Gas & Electric Bldg., Rochester, N. Y.

A dinner meeting was held at the Culver Arms May tenth with seventy members and friends attending. Chairman John Bartek introduced National First Vice-President James R. Weaver, who spoke complimentary and encouraging words about the local turn-out Mr. Weaver extended to the chapter a cordial invitation to attend Pittsburgh's meeting, especially the National Semi-Annual Meeting to be held this fall at that place.

The principal feature of the meeting was conducted by the Socony Vacuum Oil Company which comprised of a well arranged moving picture dealing with "Lubrication and Coolants." The film divided itself into three groups namely first, bearing lubrication, second gear lubrication, and third, cylinder lubrication. A distinct mark was drawn between the two prevailing types of lubrication systems, segregating themselves into floating type and the sparsely lubricated type. The three applications were dealt with in respect to both types of lubrication. Emphasis was laid on oil grades as relates to the speeds under which the mechanism operates, emphasis given by way of graphic descriptions.

Lubrication properly applied makes necessary the consideration of proper body, chemical stability, separating ability, film strength and lubrication value.

Mr. E. R. Sheldon of the Socony Vacuum Oil Company conducted a short discussion prior to the showing of the film. Mr. Sheldon was introduced by Mr. Charles Wallace, Entertainment Chairman.

ROCKFORD

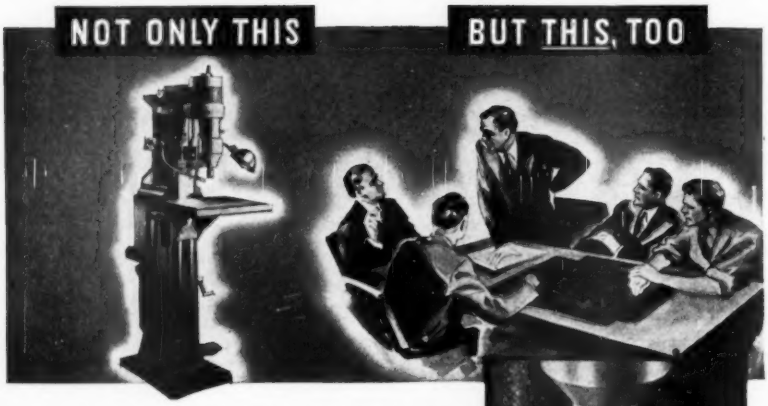
Jess A. Early, Chairman Publicity
823 Brooke Road, Rockford, Ill.

The meeting opened in the Faust Hotel on April 13th at 3:00 P.M. and occupied the entire eleventh floor. The fact that the entire floor was required for the meeting is especially outstanding when it is noted that there are two enormous ball rooms, each large enough to accommodate gatherings of ordinary clubs and societies and a lounging room as large as one of the ball rooms.

The lounging room is located between the two ball rooms and it

(Continued on page 35)

Haskins GIVES YOU..



The Haskins High Speed Tapper—combining speed, precision and construction features that are found in no other tapping machine.

Haskins Engineering Service—devoted to helping you find the fastest, simplest and most economical way to solve tapping problems.

Haskins regards it as plain good business to help you get out of the Haskins Tapper all of the speed, precision and long life built into it. That is why in so many plants today fixtures designed by, and methods recommended by, Haskins Engineers are helping to set new performance records on every type of tapping job.

Would you like to know more about the Haskins Method of High Speed, Precision Tapping? Write for complete details and further examples of the many savings it has brought. R. G. Haskins Company, 4642 W. Fulton Street, Chicago.

FOR EXAMPLE

Tapping spectacle frames was a problem until the sensitive Haskins tap head and a special air jig that raises and lowers the frame to and from the tap were put to work on the job. Tap breakage and stripped threads were eliminated; production shot up, costs down.

HASKINS PRECISION *Tapping Equipment*

Wetmore Units are adaptable to bars, boring and turning heads.

WETMORE

ANOTHER WETMORE TOOL THAT CUTS TIME AND COSTS

Note these exclusive, patented WETMORE Features: . .

—eliminates present slow, costly, unreliable methods of adjustment.

—provides rapid, accurate adjustments in either direction with graduated screw.

—wedge lock positively and solidly locks tool without changing setting.

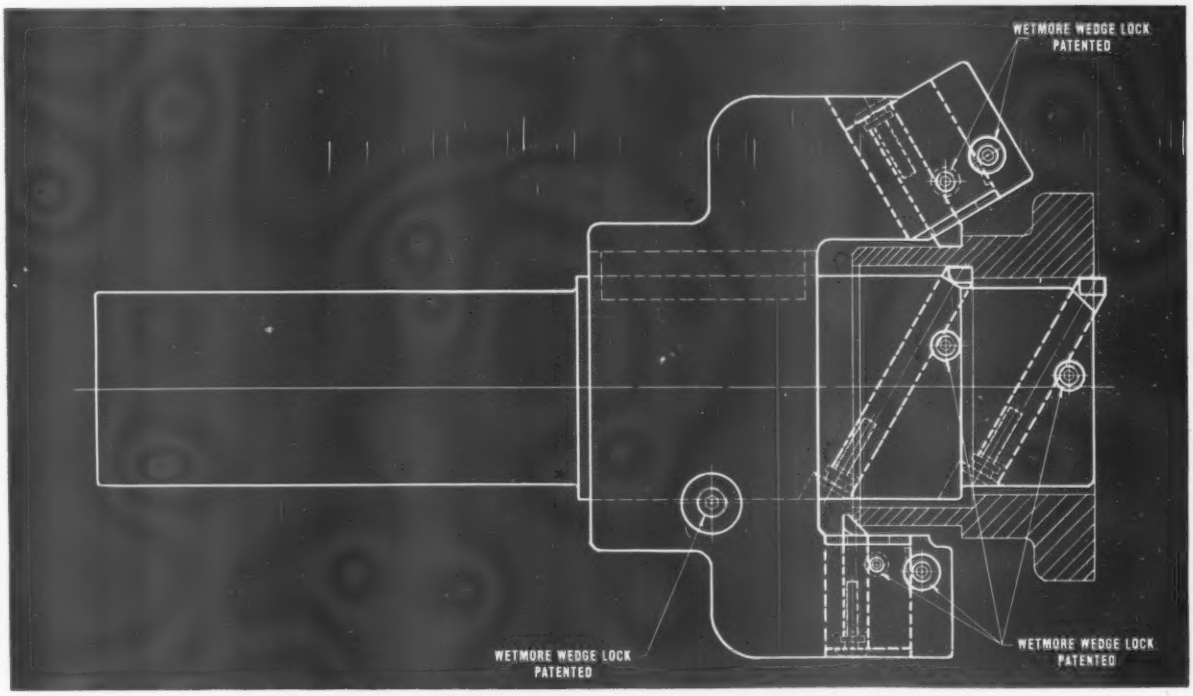
—rugged construction of unit and firm grip of cutting tools by wedge lock adds to cutting life by elimination of vibration.

—adjustment and wedge lock adaptable to all types of speed bars.

* * *

Send in your drawings—Wetmore Engineers will design tools to reduce tool-setting time and cost per piece machined.

See your Wetmore representative for many surprising possibilities and applications.



The diagram illustrates the Wetmore Boring Bar Unit applied to special boring bar with cat-head for turning and chamfering.

WETMORE REAMER COMPANY

Dept. TL 420 N. 27th St. **MILWAUKEE, WIS.**

PRODUCTION PERSPECTIVES

(Continued from Page 22)

shovel sales from all sources also contributed to the improvement.

It is reported that **spinning molten steel at high speeds to form cast steel parts of improved quality is one of the most recent experimental developments of the Ford Motor Co.** The experiment represents a new advance in the art of steel casting. The centrifugal casting experiment has been confined so far largely to blanks for transmission cluster gears and ring gears. Centrifuging insures a sound casting, free of blow holes and shrinks, it is said.

Harold E. Yale, long associated with the automotive industry in Detroit, has been **elected President** of the **Pyro-Electro Instrument Company** of Detroit. Mr. Yale's experience in sales in the industrial field will be very valuable to this company producing a very high grade line of automatic and manual hardness testing instruments. **Clarence E. Smith is** Vice President and Chief Engineer and **Chas. H. Hitch** is Secretary-Treasurer. The company has recently moved to larger quarters at 7323-25 West Chicago Boulevard giving them additional production facilities.

International Business Machines Corp. soon will begin construction of a new modern $750,000 machine shop at its Endicott, N. Y., plant, **according** to **Thomas J. Watson, president. Mr. Watson said the new building plans were proof of his company's confidence in the future.** The building will have three floors, 160 by 450 feet and be completely equipped "to take care of the future demands of our business," Watson said. Watson left May 11 for Paris where he attended the 57th meeting of the International Chamber of Commerce Council, May 20.

Charles Edward Lozier, one of the first automobile manufacturers in the United States died May 10 in Ft. Lauderdale, Fla., at 79. Born in Vincennes, Ind., Mr. Lozier came to Cleveland as a young man to engage in the bicycle manufacturing business with his cousin, Harry A. Lozier, who later was to cut such a wide swath in the automotive field. The cousins made the Little Giant and then the famous Cleveland bicycle and were instrumental in getting steel tube mills started in Shelby, Ohio, so they, like all other American bike makers, would not have to go to Birmingham, England, for their tubing. After years in bicycle making, the cousins shortly after 1900 went into production of automobiles. They brought out the first high-priced car to compete with Packard and gave it their own name. It sold for as high as $4600. Their next car was the H. A. L., named after Harry, and came out just after Charles Lozier moved to Elyria, Ohio, where he became executive vice president of the Columbia Steel Co. On leaving that post some years ago he retired and went to Ft. Lauderdale to live. He is survived by his widow and two daughters.

East

Although **the general run of industrial plants in New England continued to lag early in May, a few reported gains over the April average. Chapman Valve Manufacturing Company** of Springfield, Mass., **experienced an increase of orders in widely distributed fields** with industrial and municipal customers well represented. **Package Machinery Company,** Springfield, **reported a distinct improvement with business well diversified** and the flow of orders sufficient to warrant expectations that the present improved level will be maintained for some time. This concern is operating full time, with its force slightly increased over that of the recent past.

A rise in small-tool demand was mainly responsible for an increase of the payroll index for last month in Greenfield, Mass.

Machine-tool operations are down for the first quarter level.

Hardware sales have generally shown a good seasonal increase, retail inventories, however, have been of such proportions as to preclude any marked rise of production. **Prospects for lawn mowers and spraying devices are reported good.**

(Continued on Page 32)

"New 24 page illustrated booklet entitled 'Soluble Cutting Oil at its Best' available to personnel of metal working plants. To obtain free copy please write to 2727 South Troy Street, Chicago, using company letterhead and stating your position."

A CRANKSHAFT GETS A FACIAL

This is a day of facials, and it is not strange that we should call your attention to one Landis method of giving them.

We illustrate a 10" x 36" Type C Plain Hydraulic tooled to face grind the outside face of a crankshaft flange. The left-hand end of the shaft is held by a pot chuck, the shaft is supported at its right-hand end by means of a center rest with a quick acting jaw and the wheel base is set at an angle, the wheel being carried on the right-hand end of the spindle. Hydraulic power is used to feed the entire wheel base straight in, thereby grinding the face with one side of the beveled wheel.

Beyond doubt this operation is rather out of the ordinary, but it is meant chiefly to bring to your mind the thought that many face grinding operations may be performed on Landis equipment. 263

PRECISION LANDIS GRINDERS

LANDIS TOOL COMPANY

WAYNESBORO, PENNSYLVANIA

PRODUCTION PERSPECTIVES

(Continued from page 30)

Jobbing machine shops report a slack time in this vicinity.

Indian Motorcycle Company **has advanced its production schedule** to 30 machines a day with about 450 employed, **regarded as the peak for the year and likely to continue for the next two months.**

Demand for farm equipment is reported a source of improved orders for some manufacturers in New England. Brass, bronze and aluminum casting are sought in rather better volume, according to some reports. **Blair Manufacturing Company, Springfield, reports shipments to date ahead of last year,** but this comparison is not expected to hold for the balance of the season.

An increase in the working schedule of the J. Stevens Arms Company, Chicopee, Falls, has been announced. The **workers in two departments are to be put on a five day week instead of the present schedule of four days, with a corresponding increase of pay.** The increase schedule is due to the introduction of a new line of sporting rifles and shotguns. **A. G. Spalding Co. of Chicopee has announced an increase in working hours, changing over from a four to a five-day week.** The move results from new business.

Gifford K. Simonds, general manager **of the Simonds Saw & Steele Co., Fitchburg, announces plans are being prepared for the modernization of the company's plants.** Mr. Simonds said that **the company is not contemplating operation of the $1,500,00 unused windowless factory erected in 1929.**

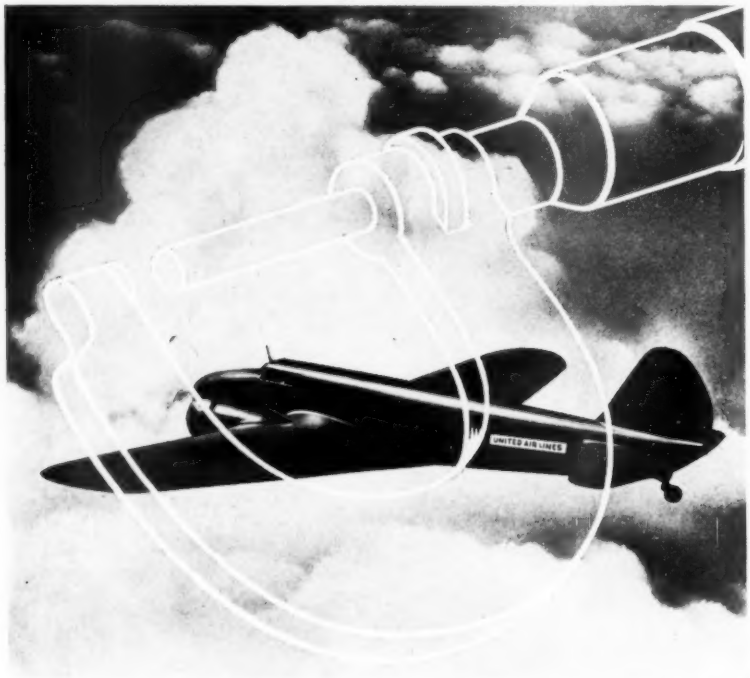
The Van Norman Machine Tool Company, Springfield, will close down for a vacation period of two weeks from July 2 to 18. Production workers will get one week's vacation with pay under the terms of the agreement between company and union which ended the strike at the plant last summer. They will take the second week on their own time. **Work at the Van Norman factory continues to hold up well with production on a two shift basis, it is reported.**

Industrial activity in Bridgeport, as measured by weekly average payrolls, faltered slightly in April, with a drop of 1.66 per cent as compared with March, a Chamber of Commerce survey reveals. The average weekly payroll for April was $914,802, contrasted with $930,257 during March. The April figure was 22.25 per cent below that of April, 1937. **General Electric Co., largest Bridgeport employer, continued operations on a somewhat spotty basis, with some departments stepping up production and others curtailing.** Unconfirmed **rumors pointed to an expectation of more intensive activity in mid-summer, as a number of employees were instructed to take their vacations before July 1. Remington Arms Co.,** a duPont subsidiary, **maintained employment for about 2,000** in its gun and ammunition departments, with production of sportsmen's firearms and shells predominating.

Industrial production in New Haven has shown little improvement, with the city's major plants operating on short time for the most part.

New Britain Machine Co., New Britain, has received an order from the Navy Department for production of projectiles in the amount of $156,000. Paul D. Fenton, sales manager of the button and fastener department, **Scovill Mfg. Co.,** Waterbury, **and Chauncey P. Goss,** 3rd, have **been elected assistant vice-presidents of the company.** Frances T. Reeves has been added to the board of directors. President Edward O. Goss and other officers were re-elected. Special orders have resulted in reemployment of 40 workers at the American Brass Co. in Torrington who were laid off.

Packer Machine Co., Meriden, has announced leasing, with option to buy, one of the larger buildings of the former Bassick Co. plant in Meriden, containing about 18,000 square feet of floor space. The step was necessitated by production increases, especially on buffing and polishing machines built for automobile manufacturers.



OFF A HAIR AND IT'S OFF A MILE

No dyed in the wool aircraft man scoffs at the importance of precision. For every aircraft man well knows that the airplane of today could never be — if it weren't for the precision methods of his industry.

Lufkin Precision Tools have played no small part in the development of modern aviation. Lufkin Micrometers and all the other Lufkin Precision Tools are built to give accurate measurements, quickly and easily. If you are interested in precision tools that you can rely upon, follow the example of America's foremost mechanics and engineers. Specify Lufkin.

Catalog No. 7 describes the entire Lufkin line of precision Tools. Write for your copy.

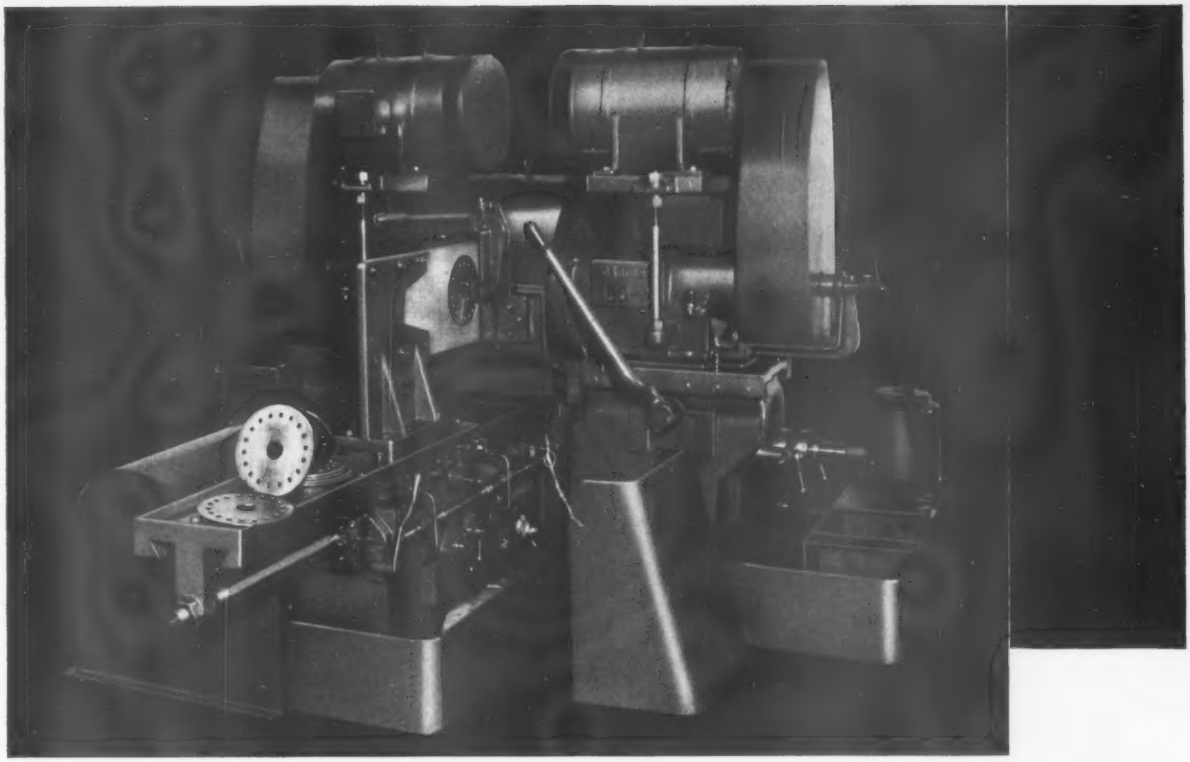
SOLD THROUGH DISTRIBUTORS

NEW YORK
106 Lafayette St.

THE LUFKIN RULE CO.
SAGINAW, MICHIGAN

Canadian Factory
WINDSOR, ONT.

TAPES — RULES — PRECISION TOOLS



ASTONISHING results from GARDNER DOUBLE-DISC GRINDING

ONE of the most unusual and striking jobs which has ever been successfully handled on a Disc Grinder, is that illustrated here.

Clutch spring discs measuring 9⅜" O. D. x ⅛" thick, and made of high carbon spring steel, are ground AT THE RATE OF 70 TO 80 PER HOUR on this Gardner No. 120A—26" Double Spindle Grinder. THEY ARE HELD WITHIN .001" FOR PARALLELISM, AND WITHIN .003" FOR UNIFORMITY. Stock removal averages .006" to .008" over all.

As can be seen, the clutch spring discs are carried between the 26" diameter abrasive wheels in a blade-type fixture mounted on an hydraulically-operated knee. The knee oscillates automatically, thus permitting the taking of several passes or cuts, while the grinding heads are hydraulically closed in upon the work. The piece is held loosely enough to permit spinning during the grinding operation, which aids materially in obtaining the close accuracies secured. This is a wet-grinding job.

Gardner PRECISION Grinders are handling dozens of parallel-surface jobs with extreme accuracy, and at surprising rates of production!

WRITE US FOR DETAILS!

GARDNER MACHINE COMPANY

442 East Gardner Street , , , , , , Beloit, Wisconsin, U. S. A.

HELICAL GEARS

(Continued from Page 14)

dead concentric with the so-called Pitch Diameter, and then rolled on center (metal to metal with a master gear, as is the common practice), this .0002" in tooth spacing would not show up in the indicator reading, and it probably would be considered a very good gear. But—we believe it is readily perceptible, that this is a false reading—that this is not a good gear, due to the fact that it produces a "galloping" rotative motion to its mating gear, because of its .0015" advance and .0015" retard, or a total of .003" in every revolution, and when this gear is put under load, possibly at 2,000 or 3,000 R.P.M., it will set up a dynamic vibration, or in other words, NOISE, and where there is noise, there is destruction.

Getting back to the method of inspecting gears for so-called concentricity: In the first place, gears are not used to transmit power in a direction coinciding with the common center-line of a pair of mating gears, and any eccentricity reading taken in this manner is of no consequence, insofar as their power transmitting properties are concerned, other than to see if they can be rotated at a given Center-Distance.

Now let us take this same gear, and hold it in such a manner as will average up the circumferential position of all teeth so that they will be equiangularly positioned, and each tooth will come to its driving position in proper time with respect to the revolution of its axis, and then finish grind the bore.

Inasmuch as a gear transmits power along a line tangent to the base circles of mating gears, (commonly called the line of action), it can readily be seen that this gear now is in condition to drive its mating gear with more UNIFORM rotative motion, free from the "galloping" element. For the express purpose of accomplishing this essential feature, we have developed and are supplying to the trade, the "Match-it" Gear Chuck, available in various types, and suitably adapted to any make of grinding or diamond boring machine.

Measuring Gears

Continuing the discussion relative to the measuring of the various elements of a helical gear, we, at this time wish to confine our statements to the two most "talked of" readings taken in the measuring of a Helical Gear, viz: Helix Angle and Involute Form.

When we speak of Helix Angle, we all realize that we are referring to the helical angle measured at the Pitch Diameter.

Now we might think of the Pitch Diameter of a gear in the same terms as we think of the Equator. The Equator is an imaginary line running around the center of the earth, used for no other purpose than as a basic position to start reckoning direction, time, and distance.

In the same light the Pitch Diameter of a gear is an imaginary line running around a gear, used for no other purpose than as a basic position to start reckoning Pitch, number of teeth, ratio, etc. As a direct result of this statement the writer claims that an inspection reading of the Helix angle taken at the Pitch Diameter is useless information, and should be forgotten, but the Base Helix Angle as measured at the Base Diameter is the all important element that governs the bearing surfaces of mating gear teeth across their face widths, referred to as longitudinal bearing. Of course, for proper involute action we must have Involute forms on mating gears that are of corresponding Pressure Angle, and this particular feature is quite easily controlled within close limits in the cutting process, but when the gears come out of the fire it is another picture due to distortion. Therefore, it makes no difference whether the error is caused by slight deviations in the Pressure Angle or the P. D. Helix Angle in the green, or from distortion in the hard. If the gear manufacturer is provided with suitable means for checking the Base-Helix Angle (which is a straight line) he can determine at once by direct reading, the cause of poor longitudinal bearing.

Standard Data Sheet Binders

$1.25 plus postage. Address A.S.T.E. Headquarters, 2567 W. Grand Blvd., Detroit, Mich., for your copy.

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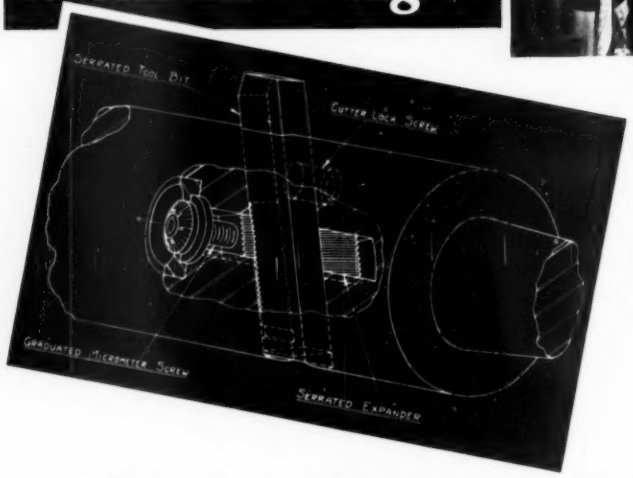

ACCURACY: Tool is precision built, assuring extremely accurate results.

INTERCHANGEABILITY: Uniformity of design and structure allow a rapid and accurate change of set-up.

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ECONOMICAL: Tools are universal in application, one tool covering a wide range of bores. Furnished in sizes for boring diameters 1⅛" and larger. Extremely effective with T. C. tipped cutters.

MICROMETER ADJUSTMENT: Minute adjustment permits as fine as .00025" adjustment on diameter.

Send us prints of your work for a special recommendation incorporating this amazing tool!

DAVIS BORING TOOL DIVISION, Larkin Packer Co., Inc.
ST. LOUIS, U. S. A.

DAVIS BORING TOOLS

CHAPTER DOINGS

(Continued from Page 28)

was there that a fine display of special tool and manufacturing equipment was put on display. There was approximately 200 sq. ft. of table space required for the exhibits.

The six following companies sent their exhibits and representatives to take part in the meeting:

Pratt & Whitney Co., was represented by:

A. H. d'Arcambal of Hartford, Conn. (speaker of the evening)
F. A. Armstrong .....Chicago, Ill.
Elmer E. White .....Milwaukee, Wis.
George Howard .....Chicago, Ill.
Jim Wilke .....Detroit, Mich.
Sam Matchett .....Chicago, Ill.

They exhibited internal and external Comparators, Master Electrolimit Comparators, Cylinder Bore Gage, Hoke Blocks, U.S.A. Blocks, Misc. Gage Sets, Precision Level and many small special gages.

Square "D" Co., Milwaukee, Wis. was represented by:

Warren Helle .....Milwaukee, Wis.
E. F. Mekelburg .....Milwaukee, Wis.

They exhibited the latest equipment in Motor Controls and Switches.

Micro-Switch Co., was represented by:

F. C. Brunka
M. W. Eaton
N. C. Fetter

They exhibited Micro Switches in their fundamental forms, Built-up Limit Switches for Machine Tools, Inspection Switches, Thermal Motor Overload Protectors.

Mechanics Universal Joint Co., was represented by Harry Nelson.

They exhibited a special built Universal Joint showing the construction and operation of it as well as smaller sizes of Universal Joints.

Rockford Drilling Machine Co. was represented by:

Harry Emerson
H. L. Scherer
Ray Carlson
Al. Gorenson

They exhibited a complete line of sizes and styles of Pulmore Clutches.

Haynes Stellite Co., was represented by:

E. F. Smith
G. B. Moynahan
J. A. Gallagher
W. A. Becker

They exhibited many small tools, cutters, etc., made of Stellite.

All this extensive display opened at 3:00 P.M. when members and their guests began to arrive. From then 'til 6:30 there was a continual milling around the exhibitors of interested spectators and a continual hum of voices asking questions, discussing the show, explaining and visiting. Intense interest was manifested in the entire show.

At 6:30 a fine dinner was served to some 200 members and guests in the South Ball Room. Introductions of the speaker and out-of-town guests and exhibitors were made by Mr. E. W. Dickett, chapter Chairman.

After the dinner there was a half hour recess for further inspection of the displays. At 8:15 when the meeting was called to order in the North Ball Room to hear the address of the evening, the attendance had grown to about 300.

Mr. A. H. d'Arcambal, Consulting Metallurgist for Pratt & Whitney Co., and past Chairman of Hartford, Conn., Chapter 7, A.S.T.E. spoke on "The Latest Developments in Cutting Tools and Gages." The discussion of steels and materials in cutting tools was accompanied by movie slides and specimens of the cutting tools. The speaker held his audience in wrapt attention more than an hour and a quarter, which brought out in bold relief both the calibre of the speaker and the eagerness with which those present are searching for more knowledge about their chosen field of work.

While the address ended about 9:30 it was nearly 11 o'clock before the last of the men was gone.

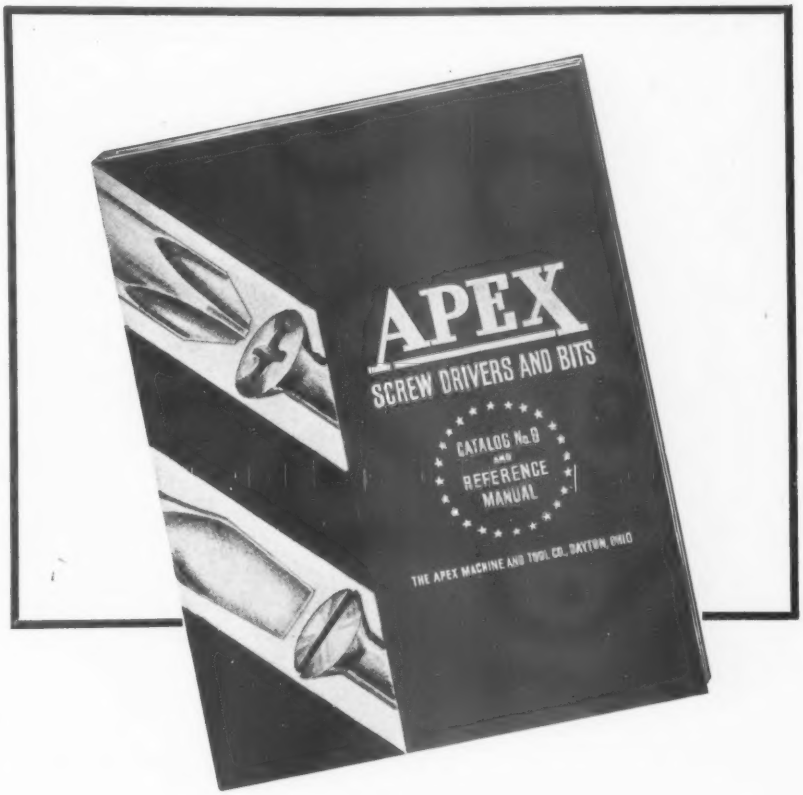
ST. LOUIS

R. E. Laffler, Publicity Chairman
710 N. 12th Blvd., St. Louis, Mo.

St. Louis Chapter held its first regular meeting, preceded by a dinner, Thursday evening, April 21, at the Saum Hotel. Chairman E. A. Doogan presided, with a smile that you'll hear about, or see, from time to time.

Officers, chairmen of the various committees, and members turned out 100%

(Continued on Page 47)



THIS CATALOG

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Complete information on Power Bits for all makes of Electric, Air or Spiral Drivers for Phillips Recessed Head and Slotted Head Screws—and, Phillips Hand Drivers.

Write for copy and discounts on your Company letterhead.

The Apex Machine & Tool Company

DAYTON, OHIO

ULTIMATE IN LIMITS

(Continued from Page 13)

express the amount of error in terms of millionths of an inch.

An instrument more efficient than the optical flat for checking length and parallelism is the 20000 to one comparator. Accurate measurements can be defined within .000002 parts of an inch. It must be evident when we deal with such infinitesimal small values as millionths of an inch that the production of parts with almost zero limits must be exercised with the greatest care and under proper conditions.

The Precision Gage Block is today universally accepted as the Master Standard of Length by manufacturers of interchangeable parts in the metal industry. The accuracy of these blocks creates confidence which cannot be duplicated with any other standard available in the shop. The manufacture of these gages is one of the outstanding achievements in metallurgy and in the art of precision lapping and measuring as applied to a commercial product. No method in mass production has created greater interest by mechanics in general than the manufacturing of the precision gage block, where accuracy to the millionth and the permanent preservation of this accuracy are the prime factors. We must pay due honor to Mr. Johannson who pioneered the development of the Precision Gage Block. Prior to the World War the Johannson blocks were imported from Sweden, but are now manufactured in this country.

The demand for these blocks increased so rapidly during the war, that a serious shortage was felt in this country. The War Department requisitioned existing sets and distributed them where needed most.

On account of this increasing shortage a new source of supply had to be created. After intensive work at the Bureau of Standards in Washington, by Major William E. Hooke, a method was developed whereby two surfaces could be lapped flat and parallel to the millionth of an inch.

The following is a description of the important points involved in producing gage blocks by the "Hooke" method.

The processing of the blocks to the point of seasoning and other operations which are of no particular interest will not be considered in detail for the sake of brevity.

No tool, whatever it may be, is any better than the steel best suited for its respective purpose, and the care it has received in heat treatment. It was a difficult task to select a steel, for these precision blocks, with the proper physical characteristics, which responded to the exacting demands in heat treatment. Many steels, including carburizing grades, tool steels and alloy steels were submitted to exhaustive test. The final outcome was the adoption of a chromium alloy steel. This material with the proper heat treatment obtains a very high degree of hardness together with correct hardening depth and with proper seasoning will retain its size and shape permanently. The chromium adds to the resistance of wear and corrosion.

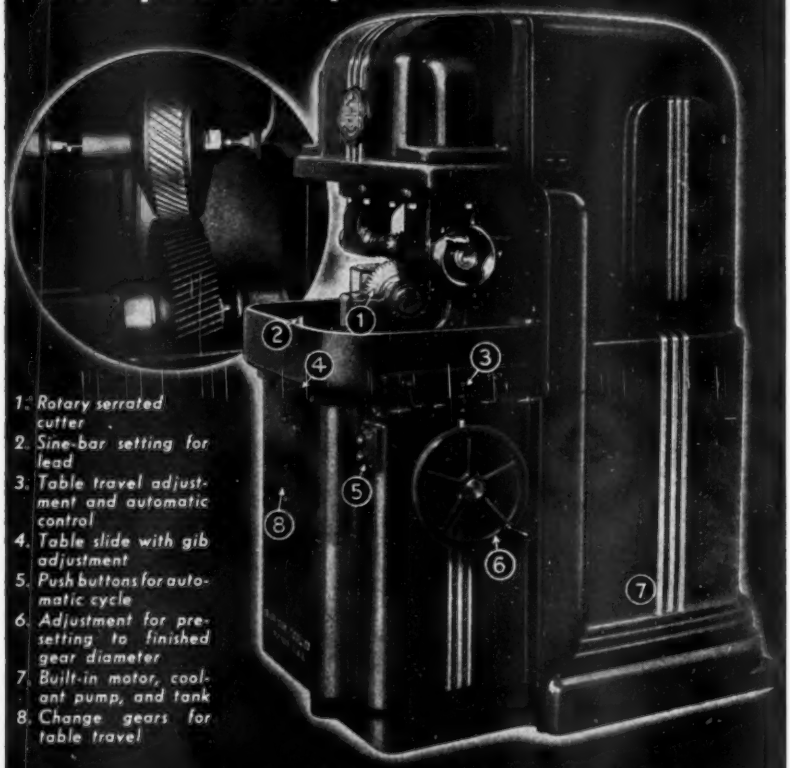
Every bar of steel is submitted to physical tests and chemical and microanalysis before entering into the production of the gage block.

Gage blocks come in Standard sets. The larger set consists of a series of 81 blocks. It is possible to combine these blocks to obtain over 100000 different gage dimensions. Sizes from .200" to 10" can be arranged in steps of .0001". It is evident then that the errors in a block must be held to a minimum so that the accumulative error of a combination of blocks will not seriously affect the desired dimension. The original accuracy must be preserved permanently, to insure that no serious increase of error will take place with passing time. Therefore, the important process of seasoning which brings the blocks into a stable condition cannot be over emphasized.

After hardening and tempering the important process of seasoning follows. At this stage the blocks possess extreme hardness equivalent to 95-1—Seleroscope reading.

If we define "seasoning" with a few words, we may say, to permit the internal structure of steel to rearrange

THE NEW "860"
for job lots, too . . . . . .



1. Rotary serrated cutter
2. Sine-bar setting for lead
3. Table travel adjustment and automatic control
4. Table slide with gib adjustment
5. Push buttons for automatic cycle
6. Adjustment for presetting to finished gear diameter
7. Built-in motor, coolant pump, and tank
8. Change gears for table travel

Just because your gear production quantities may be too small to take advantage of the maximum economies of the MICHIGAN Rack Type finisher is no reason—NOW—why you cannot finish your gears by crossed-axis shaving. The new Michigan "860" is low in initial cost and low in tool costs.

Its flexibility makes it ideal for job lots, yet it is the most rigid machine of its type on the market. Its action distributes wear evenly over the cutter—increasing cutter life and insuring maintenance of accuracy. More gears are finished today on MICHIGANS than on all other makes combined.

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Please send further information regarding the new '860' and your bulletin No. 101-61.

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Mention "The Tool Engineer" to advertisers

itself into a homogeneous unstressed body.

The natural process of seasoning is to permit a piece of steel after hardening and semi-finish grinding to lay for a long period of time. The time allowance depends on the size and shape of the piece. This will permit a slow and gradual relief of the internal strains, which cannot be avoided during the process of hardening. This method is not practical in a production line-up. Artificial seasoning which greatly reduced the time interval required for natural seasoning is better adapted where production requires a steady flow of parts. Seasoning by submitting the part to high frequency vibrations is one method which has found applications in many cases. But seasoning by repeated immersion of the parts in alternate sequence in hot and cold solutions has been used for many years and proved to be reliable and efficient to a high degree. Other processes now in use which are trade secrets. The results obtained with these highly developed methods approach the maximum stabilization point very closely.

Every Gage Block must be sound in structure and free from flaws and cracks.

These defects will show up very plainly by applying a simple but effective inspection method.

The block is immersed in a bath of kerosene which contains in suspension very fine steel dust. The steel dust is

(Continued on Page 38)

VISE

With and Without Jig Attachments

A good one for the DRILLER, MILLER, SHAPER, or PLANER.

Jaws 6", 9" and 12" Long

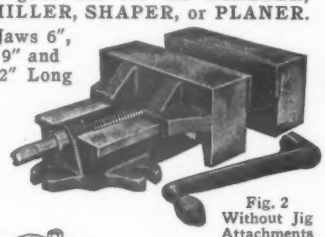

Fig. 2 Without Jig Attachments

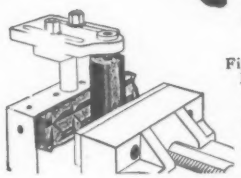

Fig. 3. V-Jaw Holds round work vertically or horizontally.

Send for Circulars

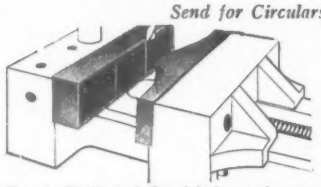

Fig. 4. Shell, and Special Jaws of your own make hold Odd-Shaped Pieces.

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again have proven to be way ahead and far superior to any device on the market. Check the following features:

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3. **Mechanical labyrinth oil seal to keep oil inside tapper.**
4. **Overflow plug makes oiling easy and over-oiling impossible.**
5. **All parts interchangeable including actual frictions.**
6. **Double reverse speed.**
7. **Tap chuck automatically goes into neutral when frictions are not engaged.**
8. **Positive drive single purpose collet chuck, light in weight, extremely accurate. Collets available for all taps, sizes from No. 2 to ¾".**

Write for new catalog showing our complete line of Tapping Attachments, Quick Change Chucks and Collets and Tension Adjustable Screw and Nut Setting Clutches.

The Chas. L. JARVIS Co.

MIDDLETOWN, CONN.

ULTIMATE IN LIMITS

(Continued from page 37)

attracted to the block by residual magnetism due to previous contact with a magnetic chuck. Even the most minute cracks become visible when examined under a magnifying glass, because the steel particles build up along the edges of those small cracks caused by the lines being interrupted, that is, the lines of magnetic force being interrupted by the defect.

The blocks enter now the beginning of the final operations. The lapping process is entirely mechanical on special lapping machines.

These machines with which I believe all of us are acquainted, differ from the conventional type lapping machine on the following points:

On the conventional lapping machine one or both laps revolve and the work creeps between the surfaces of the two laps. On these special lapping machines the upper and lower lap is stationary and the work is pulled with a spider between the laps with a positive planetary, oscillating motion. The gear ratio of the spider movement is such that about every 300000 revolutions the same path of the blocks on the lap is reproduced thereby assuring an even distribution of wear on the laps.

Lapping one surface flat to millionths of an inch, we all must agree is a noteworthy performance, but to lap two surfaces flat and parallel within a few millionths and hold a specified length at the same time within this limit is a great achievement. The lapping process must be so controlled, so that the gaging surfaces of the blocks gradually approach flatness and parallelism as they are reduced to the required size.

Due to small grinding errors in length and parallelism of the two faces, the upper lap will rest on the three highest points. In all probability the lapping surface of the upper lap will not be parallel with the lapping surface of the lower lap. As lapping progresses these high spots will be reduced and more blocks will contact the laps. If the lapping operation were continued with the blocks remaining in their original position, in the spider, the surfaces might be finished flat but the upper and lower surfaces would very likely not be parallel to each other.

To accomplish the essential accuracy in parallelism and flatness the blocks are changed in their relative positions quite frequently during the lapping process.

Much of the accuracy of the blocks depends upon the cast iron laps. The lapping surfaces must be absolutely flat and free from defects such as hard and porous spots.

The last important operation is the final inspection which is performed with the previous mentioned methods at the industrial standard temperature of 68° Fahrenheit.

HEAT TREATMENT OF SPRINGS

(Continued from page 11)

cepted tolerances on such a spring would be plus or minus .002" on the wire size, plus or minus $\frac{1}{32}$" on the diameter, plus or minus $\frac{3}{32}$" or .093" on the length of the spring, and plus or minus one-half coil on the number of coils.

When calculating springs where particular consideration is given to stress, the Wahl factor should be used. This factor takes into account the total stress imposed on the wire as the ratio of wire size to the mean spring diameter changes. Mr. A. M. Wahl of Westinghouse Electric & Mfg. Co., Pittsburgh, developed this formula. By obtaining the numerical ratio of mean diameter to wire diameter, a factor can be obtained from a curve which is "Y" in the Wahl formula.

We urge all calculations of important high duty springs such as valve springs or any spring having a ratio between wire diameter and mean spring diameter of less than eight be made with this correction factor. This correction factor is not found in the usual engineering handbooks but should be taken into consideration when springs must be figured to the maximum allowable stress as in many cases of small tool design where a maximum strength is desired and only a comparatively small space available for springs.

LOWER COST DIE AND TEMPLATE WORK

Baker Contour Grinder meets todays demand for production of better dies at lower cost because (1) Table is fully accessible and size of work is not limited by obstructions. (2) Without change, the machine handles internal or external grinding. (3) Complete visibility allows operator to follow template or scribed line. (4) Easily controlled vertical reciprocation increases life of wheel and increases cutting efficiency.

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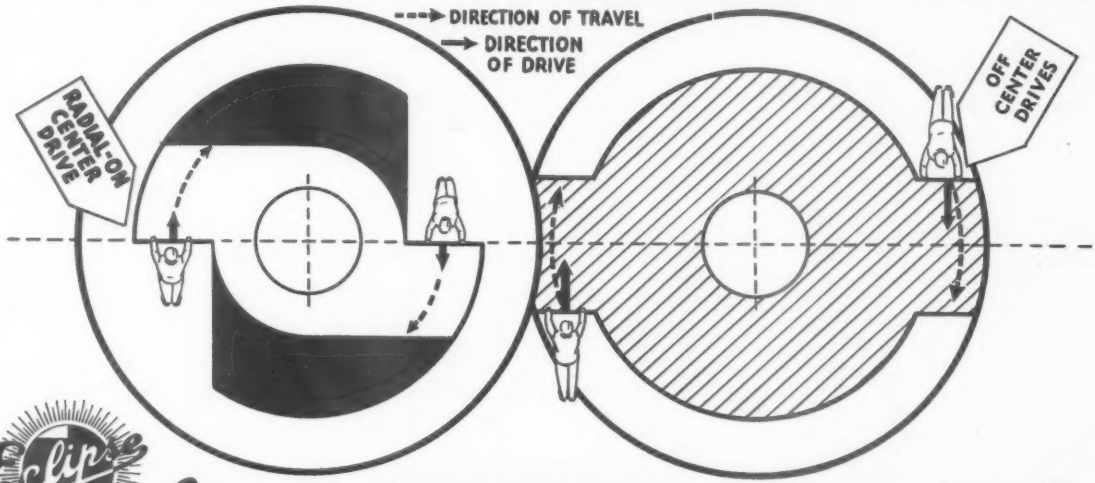
FOR USE ON PLANERS, BORING MILLS, MILLING MACHINES OR OTHER MACHINES WITH SLOTTED TABLES

THESE bolts are manufactured in the same factory as the well-known "O. K. System of Inserted-Blade Metal Cutting Tools," and with the same relative care. They are forged of special medium carbon steel, heat treated for maximum toughness. The heads are milled accurately to size. With each bolt is furnished an O. K. nut of special design, in which nut and washer are incorporated into one unit. Having nut and washer integral eliminates time which is often wasted trying to keep tabs on separate washers. This flanged nut is made of the same tough steel as the bolt itself.

"O. K." Tee Slot Bolts may be obtained in any length, from 2" long to 24". A circular completely describing and pricing the line will be sent you on request.

THE O. K. TOOL CO.,
Shelton, Conn.



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ECLIPSE incorporates the "lever" principle in the design of RADIAL DRIVE CUTTING TOOLS with DIRECT ON CENTER DRIVE!

ECLIPSE COUNTERBORE COMPANY
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ARBOR PRESSES and VISES

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12 Sizes
From ¾ to 10 ton
Pressure

Plain and Swivel Milling Machine Vises
4 Sizes
3½ to 8½ inch Jaws

Drill Press Vises
3 Sizes
4½-6½ and 9 inch Jaws

Shaper Vises
2 Sizes
12 and 14 inch Jaws

Ask for No. 25 Catalog and Price List

SHELDON MACHINE CO.
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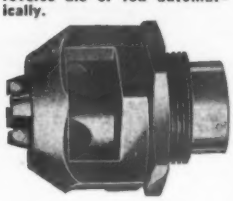
Left: Regular holder for automatic screw machines that reverse die or rod automatically.



Above: Adapter, for button, spring or floating holders.

Right: Releasing holder, for B & S plain and automatic screw machines.

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for faster threading, greater production, maintained accuracy. They fit ALL types of machines.

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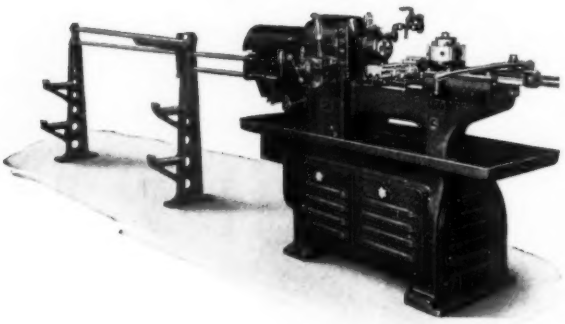

No. 1 Screw Machine

Note these features:

$\frac{13}{16}$" regular, or $1\frac{1}{16}$" special round bar capacity.
Bar loaded from operator's end of rack.
Eight spindle speeds which are dial selected from 300 and 3600 RPM.
Quick change from high to low range of spindle speeds.
Mechanically operated automatic chuck and bar feed; also hand operated automatic chuck for second operation work.
Combination screw and lever feed cross slide.
Turret automatically clamped, indexed, and re-clamped by movement of turret slide.
Leveling blocks for quick and accurate leveling of machine.
Turret slide may be lever or turnstile operated.

FOSTER MACHINE COMPANY
ELKHART, INDIANA

MODERN DIE-MAKING MACHINES

NEW EFFICIENCY
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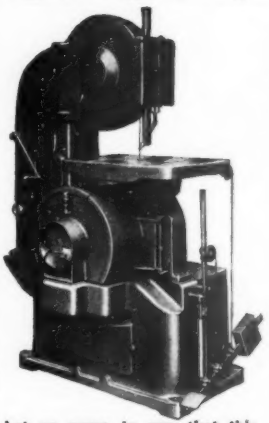
GROB Open End Band Saws



Let us prove to you that this machine will saw out dies from 25% to 100% faster than any other die-saw.

Never has there been a Metal Band Saw with so many practical features built into it . . . features that mean speed, accuracy and economy in die-making. Here is a machine that will handle heavy massive dies or small delicate ones with equal ease and precision.

NO BRAZING
NO WELDING

Brazing and welding are entirely eliminated with this machine. It requires but 20 seconds to set up for internal sawing. Send for complete detailed catalog.

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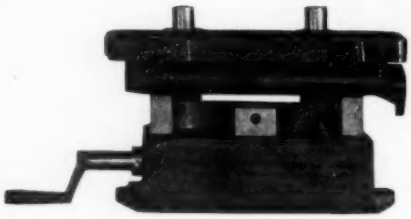

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¼" Spring Follow Up.
Ease of Operation.
Right or Left Hand Operation.
Adjustable Clamping Pressure.
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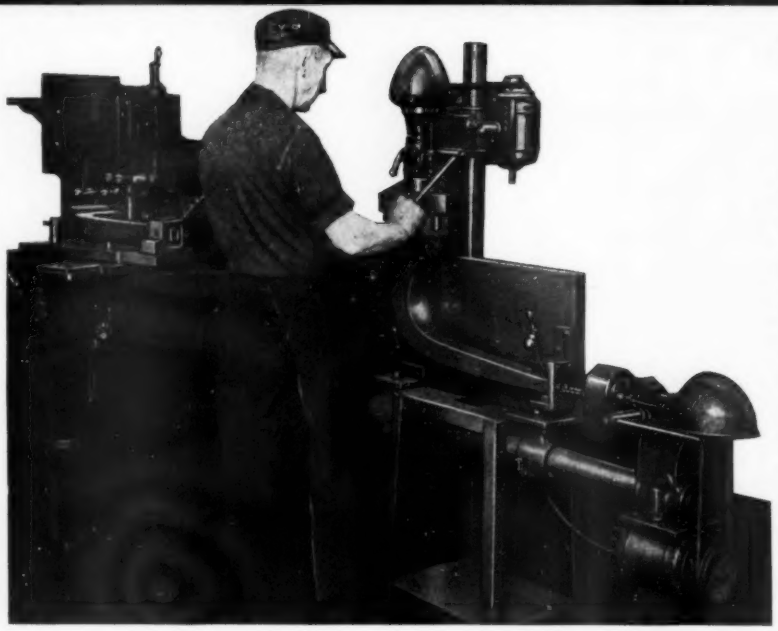

HOW TO PUT IDLE TIME TO WORK !

This photograph shows the milling and drilling of an overarm for a scroll saw. The operator loads the arm in the milling machine, starts the first cut, then loads a previously milled arm into the special drilling fixture set beside the milling machine and drills four holes in the arm. By the time this operation is completed the first cut is finished on the milling machine. The arm on the milling machine is then indexed for the second cut, and, while this cut is being made, the operator transfers the drilled arm to another Delta drill and taps two holes. The drilling and tapping operations are done during the time that the operator would otherwise be idle—so these operations cost nothing for labor!

The portability and adaptibility of Delta drill presses, which enable them to be set up alongside another machine to utilize idle time, are only two of the many advantages offered by this low-cost, high-efficiency equipment.

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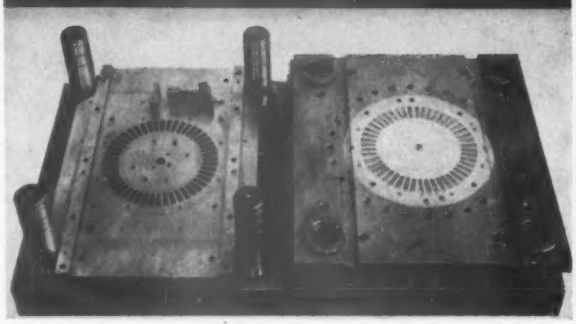

Photograph, Courtesy of Urbana Tool & Die Co.

Two dollars worth of CERROMATRIX used for locating the punches saved more than 100 hours in making the lamination die shown above.

The Urbana Tool & Die Company, Urbana, Ohio, one of the largest custom tool and die plants in the country, have been using the CERROMATRIX method of constructing regular production dies for four years with substantial savings to their customers. Advantages of this type of construction are: die life is increased due to more accurate alignment of punches; savings of 10 to 100 hours or more with only a small amount of alloy; dies made in less time, thus insuring earlier shipment.

CERROMATRIX expands slightly on solidification, creating a tremendous pressure around each part, whether it be in a die or a machine tool. Many expensive dies that have cracked in use or in hardening, have been reclaimed for regular production by casting CERROMATRIX in a cavity surrounding the parts. Applications for this unusual alloy are almost unlimited.

Other useful low-temperature-melting alloys are: CERROBEND for filling tubes and metal mouldings while bending, and CERROBASE, a non-shrinking metal for proof casting and duplicating master patterns.

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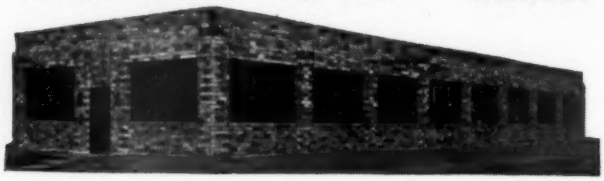

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FABRICATING MACHINERY

Plans for 1939 MACHINE & TOOL PROGRESS EXHIBITION Announced by A.S.T.E.

Announcement has been made by the Executive Committee of The American Society of Tool Engineers that another Machine and Tool Progress Exhibition will be held again in March, 1939.

The Committee met recently in Detroit and discussed plans and details for the show. It also confirmed various National committee appointments by President Walter F. Wagner, which are listed on the title page of this issue of "The Tool Engineer."

Syracuse Charters A.S.T.E. Chapter June 6th— Schenectady, June 7th

Tool Engineers of the central New York state area have decided to form a chapter of The American Society of Tool Engineers and plan to have their organization meeting, June 6. The location of the meeting will be in some downtown hotel, club or restaurant, undetermined at the time of this writing, and it is expected that Tool Engineers from the Syracuse area and nearby cities will attend.

Tool Engineers of this area who may be interested in attending this important and interesting meeting should communicate with any one of the following men who have been instrumental in establishing this chapter: Ray Adams, care of A. V. Wiggins Company, 328 Fayette St., Syracuse; Mr. Robert Russell, Porter-Cable Division, W. C. Libe Corp.: Mr. A. M. Johnson, 501 Water Street, Syracuse, N. Y.

Schenectady, New York, will charter a chapter on June 7th. Interested friends and members of A.S.T.E. should contact Mr. George F. Murphy, Bldg. 37, General Electric Company, Schenectady, N. Y., for details of meeting place, time, etc.

THIS MONTH'S COVER
Chips May Fall Where They Will—But They Meet Again

The photographer has found for "This Month's Cover" an interesting phase of mass production as practised in Dodge automobile factories. Machine chips, here, may fall where they may, but soon after that they are scooped into floor chutes for a return engagement in the foundry where they are remelted and cast, again, into parts similar to those from which they came.

Prevention of waste and the fullest use of raw materials are among ways in which modern mass manufacturers achieve production economies and low unit costs.

TWIN CITIES MINNEAPOLIS—ST. PAUL
P. A. Clark, Publicity Chairman
5513 13th Avenue South, Minneapolis

The monthly meeting of the Twin City Chapter of the American Society of Tool Engineers No. 11, which included a dinner, was held Wednesday evening, May 18th, at the St. Anthony Commercial Club. There was a record attendance of (73) members and guests.

Plans were discussed for a social get-together for the beginning of the autumn series of meetings; other business included the voting of an assessment of 10c per member to be collected each meeting—this money to be used to take care of running expenses of the chapter.

The program consisted of a talk on "Tooling for Turret Lathes & Automatic Chucking Machines." The slides accompanying this lecture proved to be an interesting feature; they showed a highly diversified range of machines, a large number of interesting parts and the tools and setups used in making them. The subject was ably presented by Mr. Geo. M. Class, Chief Engineer of the Gisholt Machine Co. of Madison, Wisconsin. With him were Mr. Warren Hanum, Sales Manager, and Mr. Crossman, Publicity Manager of the same firm. This discussion was one of the most interesting this chapter has heard.

Before closing the meeting, Chairman Wise announced that the Minneapolis-Honeywell Regulator Company had invited the Chapter to a tour of their plant, as a feature for one of the fall meetings.

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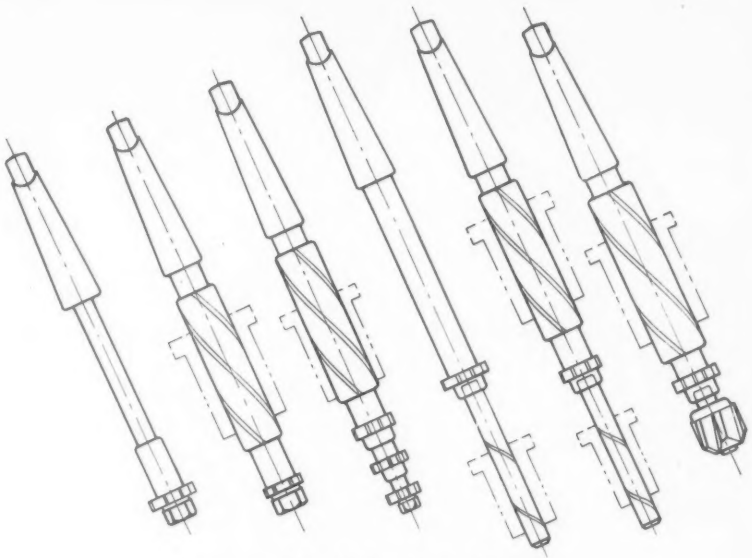

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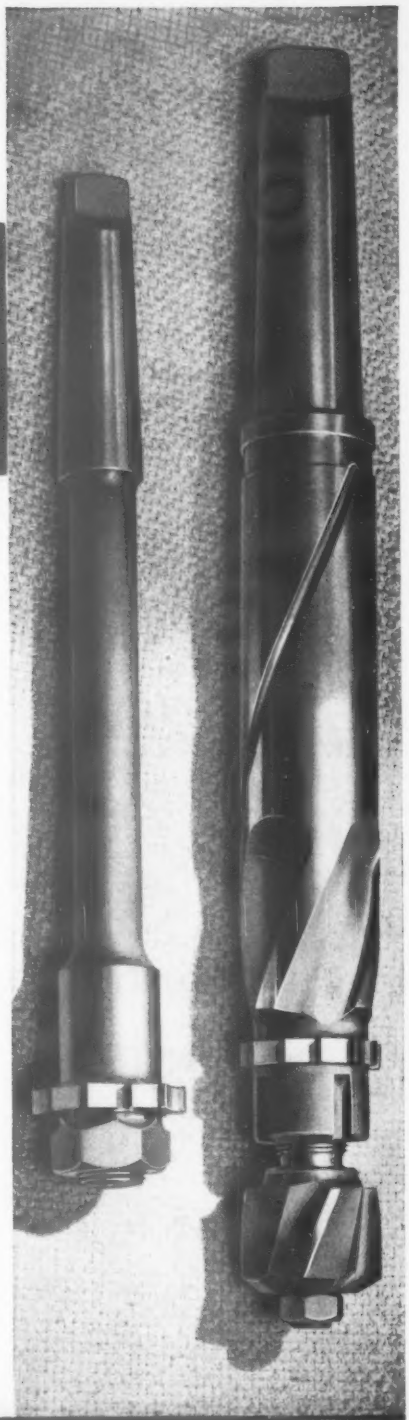

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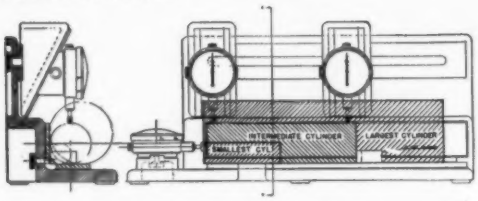

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CHAPTER DOINGS

(Continued from page 35)

to hear Mr. H. Goldberg, Chief Engineer of the R. G. Haskins Company, tell of the various tapping problems and what could be done to overcome them. The demonstrations given by Mr. Goldberg and his associates were educational, and the open discussion after his talk was very interesting. We want to thank him very much, and hope to hear him again.

The membership committee reported new applications, and anyone desiring blanks should write or phone Mr. R. B. Hartsock of the Knapp-Monarch Company.

Mr. C. J. Steinman is to be congratulated on his program arrangement, and he has promised us a good one for our next regular meeting.

Our Treasurer, Mr. H. Linders, reported a debit balance. Not being a C.P.A. we don't know what that means and he was asked to change it before the next meeting.

Our Secretary, Mr. H. F. Tomasek, looked like a foreign diplomat entering the meeting. We bet he had enough data in that portfolio to be a good salesman—and sure enough! He sold some First Vice President James R. Weaver, Linders.

We were glad to have so many visitors, and hope they come again.

(See also page 44 for Chapter Doings in St. Paul-Minneapolis).

Coupling Sales to Research

A Summary of an Address by R. E. Zimmerman, V. P. United States Steel Co. Before the Annual Meeting of American Iron and Steel Institute.

Discussing the growing importance technical research has assumed in industry since the turn of the century, Mr. Zimmerman said, "improved railroad equipment, from roadbed to rolling stock, the automobile with its manifold requirements, apparatus for the production and refining of petroleum, electrical equipment in almost endless variety, new processes for canning, and specialized agricultural implements—all these serve to call attention to what was developing in the fields of various industries which in turn would require technical assistance all the way from raw materials to sales service."

In his opinion, he stated, sales are coupled to technical research by three bonds which are the scientific study of products, processes, and long range problems.

"Product research is just one of a number of important factors which have a bearing on each case," Mr. Zimmerman explained, "and without sales collaboration, could easily be excellent but futile."

"In the case of automobiles, research and development have created markets and fostered sales practically to the limit of purchasing power. The American chemical industry has grown and prospered because year after year it has developed and offered to the trade new and improved products, the so-called 'test tube babies,' many of them 'children of the depression.' This is a prolific family, responsible for a tremendous volume of business."

Process research was described as affecting products in either or both of two ways that are of interest to sales departments—first, by reduction of cost and second, by better control and general raising of quality.

Referring to the broader aspects of technical research, Mr. Zimmerman pointed out that research in one industry stimulated similar studies in other industries, holding that "it must be so if maximum progress is to be made, because new outlets must balance new inlets."

EXTRA! FLASH! FLASH!

Detroit newspapers Friday, May 27th carried front page news of the Irish Sweepstake winners. Our own HANDY ANDY RYLANDER is a winner of a minimum of $2,651.00 and possibly considerably more. See next issue for more details.

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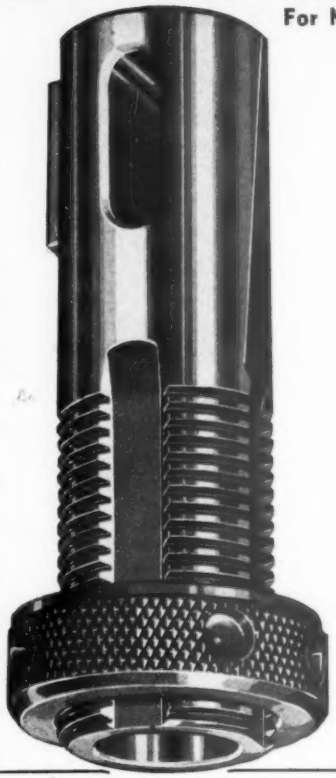

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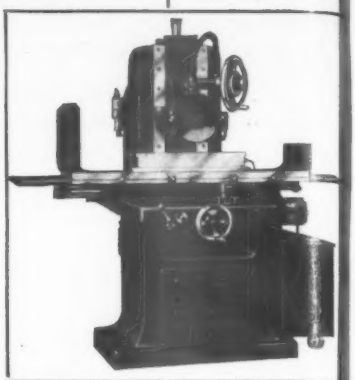

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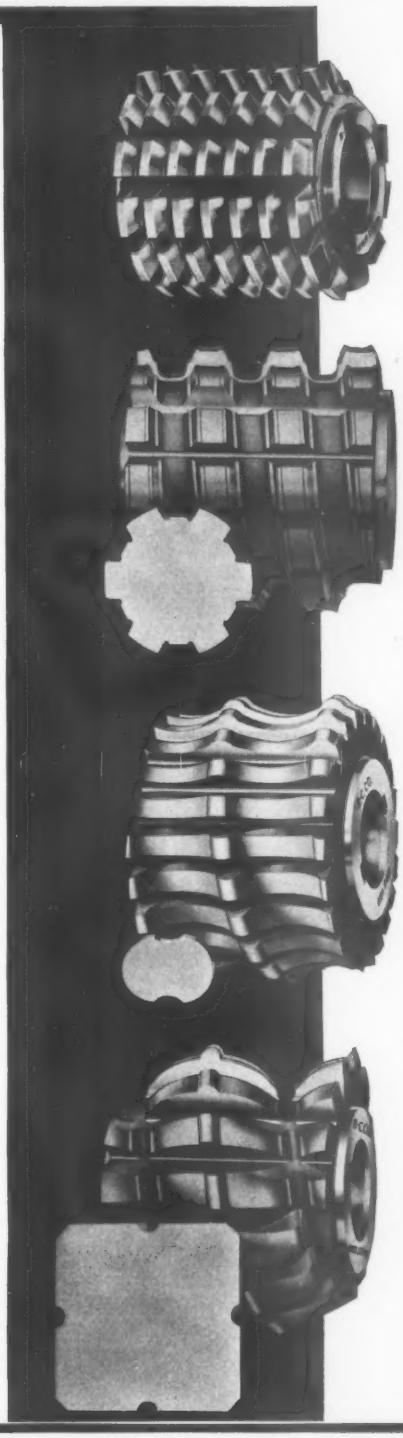
★**Wanted**—A young growing concern manufacturing a nationally advertised machine tool attachement requires services of an all around man. Must be experienced in designing machines, tool design, tool making, bench work and machine operator. This is a splendid opportunity for a man having initiative, creative ability and one who is fond of hard work. We want a man who can be his own boss. Location New York State. Address "The Tool Engineer," 2842 W. GRAND BOUL., DETROIT, MICH. BOX 533.

Use BARBER-COLMAN GROUND HOBS

For Accuracy, Service, Value

For greatest accuracy, uniformity and finest finish in the product . . . use ground hobs. For long tool-life, exact duplication of replacements, and greatest value per dollar of investment . . . use ground hobs.

Barber-Colman metallurgical research prescribes steel of special analysis exactly suited to specific hobbing conditions. Extensive use of hobbing in our own plant, and the manufacture of hobbing machines as well as hobs, qualifies Barber-Colman engineers to render expert advice and service. Special machines and carefully trained men are employed exclusively in the production of Barber-Colman ground hobs. Result, Barber-Colman hobs—ground or unground—are unexcelled in quality and value per dollar of purchase price. The unground hobs are perfectly satisfactory for ordinary work. When extreme accuracy and fine finish are required, ground hobs should be used; and this can be done most economically when Barber-Colman Hobs are selected. Try Barber-Colman Ground Hobs on your most exacting work . . . and if you have an unsolved hobbing problem, let Barber-Colman engineers figure on the answer.



Ground Hobs for gears, sprockets, ratchets, and similar parts having any practical tooth form or pitch.

Ground Hobs for spline shafts in any size, shape, and number of splines that can be hobbed.

Ground Hobs for curved shapes. Hob shown is for an impeller section requiring high accuracy and fine finish.

Ground Hob for straight-sided heading die. Note curved surfaces on tooth form, all finished accurately by grinding.

BARBER B-C COLMAN

PRODUCTS

MILLING CUTTERS, HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, SPECIAL TOOLS

BARBER-COLMAN COMPANY

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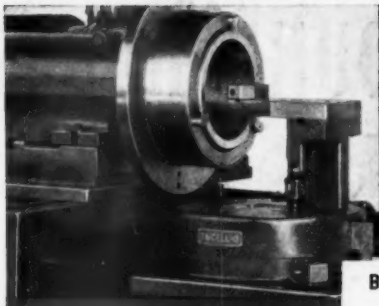
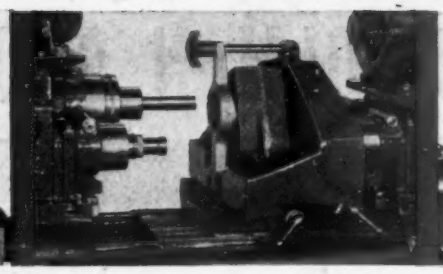
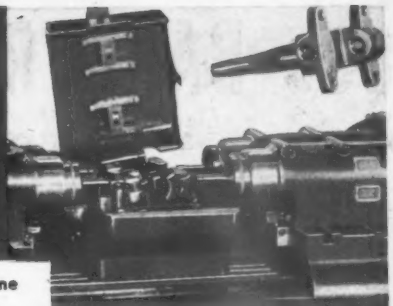
3030 Euclid Avenue

DETROIT, MICHIGAN
Hodges Machinery Company
544 New Center Building

MILWAUKEE, WISCONSIN
Dumser & Schroeder
610 West Michigan St.







Boring five bronze bushings in a valve housing in one set-up. Accurate alignment of holes assured.

● FOR *Low Cost Precision* BORING

EX-CELL-O Flexibility FEATURES:

1. Standard unit construction—nine machine styles, four bridge types, twelve spindle units, and three hydraulic systems. Fixture designed to suit your parts.

2. Spindles can be mounted at any angle to the line of table travel—for taper boring or taper turning.

3. From one to four spindles can be mounted on a bridge—wide range of spindle center distances.

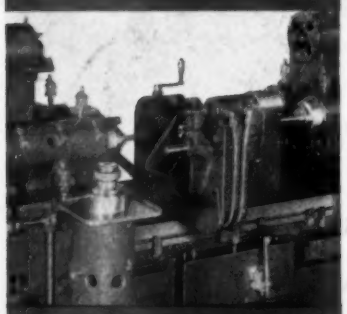
4. Bridges can be adjusted endwise on the machine base rails—to reduce lost time and motion in table travel.

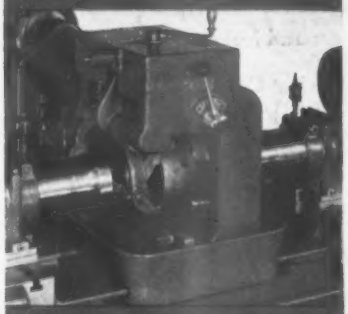
5. Table operation is hydraulic in both directions on all machines—for boring in, or for boring out deep or blind holes.

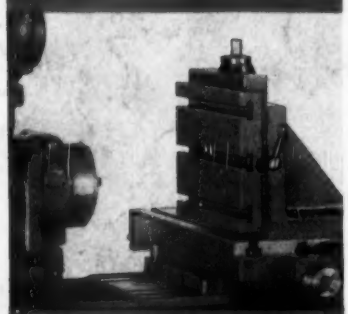
6. Wide range of materials—cast iron, steel, aluminum, babbitt, bronze, brass, etc.—can be bored, turned and faced.

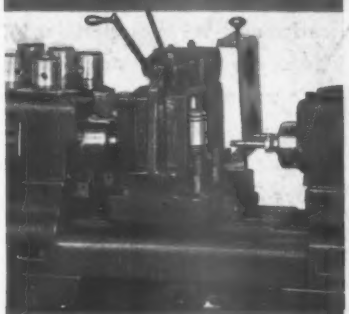
7. On one machine you can handle a wide variety of parts, sizes and operations, with quickly and easily interchangeable fixtures.

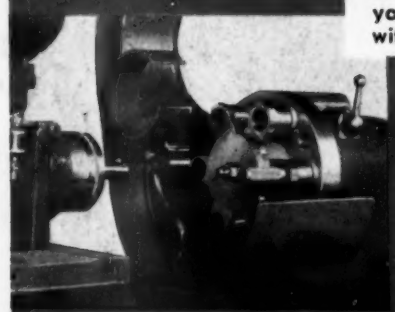
8. A standard Universal Fixture enables you to handle small or experimental lots, or, with a sub-fixture, medium production.

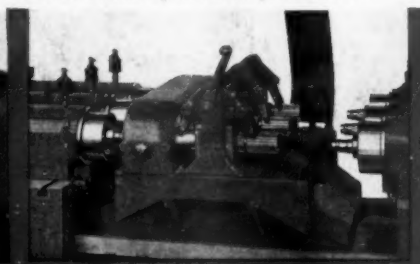


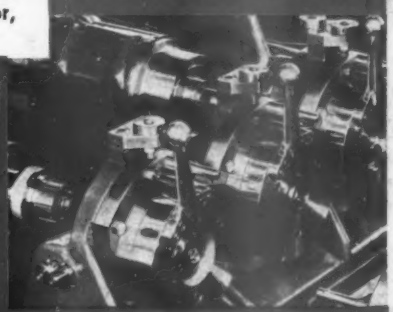












Aircraft engine propeller shafts with six equidistant holes bored in one set-up. Holes are bored straight, round, accurately located.

Boring both ends of a steel synchronizing clutch at 230 an hour. Machine is in its fifth year of continuous operation.

For six years, this machine has been boring cluster gears in an automobile plant and is still going strong.

EX-CELL-O CORPORATION, 1204 Oakman Blvd., Detroit, Mich.

Please send me, without obligation, your latest catalog on Precision Boring Machines (Also, on the products I have checked at the left).

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